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ABSTRACT

This symposium focused on curricular developments and trends, prediction models and inputs from psychological testing, a developmental counseling program within a 2-year technical institute, and their implications for vocational-technical education. Four papers were presented: (1) "Recent Developments and Trends in Vocational-Technical Education and Curriculum," by Edward J. Morrison, (2) "Testing for Vocational-Technical Training Programs," by Lonnie D. Valentine, Jr., (3) "Inputs to Vocational-Technical Education from Occupational Research," by Raymond E. Christal, and (4) "What Can Happen When There Are Enough Counselors: One Approach at a Two-Year Technical Institute," by Francis D. Harding. W. Wesley Tennyson presented a summary statement and integration of the implications for counseling practice and counselor education. (CH)

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Vocational-Technical Education: New Horizons

A symposium presented at the meeting of the
American Personnel and Guidance Association

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RECENT DEVELOPMENTS AND TRENDS IN VOCATIONAL-TECHNICAL EDUCATION AND CURRICULUM[1]

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Vocational and technical education, viewed broadly as the formal preparation for work, is an enormous and diverse enterprise in which institutions and students of many types are engaged. Providing preparation for careers requiring less than baccalaureate achievement is a particularly complex enterprise encompassing programs of the armed services, industry, private and proprietary schools, and numerous other agencies in addition to the public educational institutions (Clark, 1958; Clark & Sloan, 1966, 1968; Weinstein & Jurkowitz, 1967). Since a brief review of so complex an area must be limited to only a portion of that which is available for discussion, this paper will concentrate on public vocational and technical education and, within that context, on four discernible trends in curriculum development. You may wish to add to my suggestions concerning the implications of these developments for guidance and counseling.

Policy, Program and Support

Before discussing recent curriculum developments, we should note that those developments are part of a much broader, dramatic change in vocational and technical education dating primarily from the Vocational Education Act of 1963 (Public Law 88-210) and its 1968 amendments (Public Law 88-210 Amendments). These two pieces of Federal legislation, responding to painfully apparent public needs, provided vocational education with a broadened and thoroughly revised base in policy and funding. Prior to the 1963 Act, there was no integrated Federal program of vocational education and only rare examples could be found at state and local levels. Instead, modest support was provided for a few occupational categories, or service areas, identified prior to the sweeping social and industrial changes begun with World War II. This elderly system was overwhelmed by the greatly increased demand of post-war business and industry for capabilities in a bewildering variety of occupations, and by the special needs of millions of youth accumulating in urban areas, or left in rural communities, whose education deteriorated as the essential tax base and leadership flowed to the suburbs.

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[1] Presented at the meetings of the American Personnel and Guidance Association, Las Vegas, Nevada, 2 April 1969, as part of a symposium, "Vocational-Technical Education: New Horizons."

The 1963 Act defined vocational education to include preparation for any and all nonprofessional occupations, directed its provisions to specified groups of students, rather than to particular service areas, and stated its purpose to be development of a vocational education system. It intended that all persons of all ages in all communities would have ready access to vocational training or retraining of high quality, which was realistic in the light of actual or anticipated opportunities for gainful employment, and which was suited to their needs, interests, and ability to benefit from such training. States were given responsibility for planning, development and operation of integrated vocational programs incorporating periodic review provisions and participation of representatives from important segments of society.

The 1968 amendments consolidated all Federal vocational education acts administered by the Office of Education, introduced a number of administrative changes, provided new emphasis and support for several programs, and authorized funds, not yet appropriated, totaling ten times the actual Federal expenditures on vocational education in 1965, the first fiscal year of the 1963 Act.

Even though Federal appropriations have been less than authorized, total support for vocational and technical education is increasing. Encouraged by the help and guidance available from the Federal program, states and local agencies have increased their investments in vocational education substantially and found ways to make possible many important projects. Hundreds of new and revised facilities have entered construction. Three major research and development centers have been established and are producing a wide range of products. An ERIC Clearinghouse for Vocational and Technical Education is in operation and distributes regular volumes of abstracts for both research materials and instructional materials. Research Coordinating Units have been established in most states to provide assistance to local districts and leadership in the development, dissemination and application of new knowledge. Many research, development and demonstration programs are underway and numerous training programs for teachers, teacher educators, administrators, state department personnel, and researchers have been conducted. It seems fair to say that vocational education has entered a new era characterized by a new self-concept and by expansion, experimentation and change.

Curriculum Trends

Among the most interesting and important recent developments in vocational education are those affecting the future character of curricula. I would like to discuss some of these developments and to organize the discussion around four trends which seem to be emerging: toward curricula which are (a) more responsive to the requirements of the job market, (b) more responsive to the needs and interests of students, (c) more efficiently integrated with other educational programs, and (d) providing more vocational flexibility. Where possible, the discussion will refer to more recent projects and reports than those likely to be known to you already. This complicates the documentation, but may serve better our interest in new developments.

Relevance for the labor market. Even though vocational course designers long have used such methods as occupational analysis and follow-up of graduates, one of the major criticisms by the Panel of Consultants on Vocational Education (1963, pp. 206-214) was that vocational education was insensitive to changes in the labor market. Studies of vocational students and graduates (Eninger, 1965; Kaufman, Schaefer, Lewis, Stevens, & House, 1967) indicated little relationship between the pattern of enrollments and the distribution of occupations in the community and found that relatively small proportions of vocational graduates obtained jobs directly related to their training. Recently, there has been an effort to correct this shortcoming and it seems reasonable to expect that a substantial and increasing proportion of new programs will provide more appropriate preparation for real job opportunities.

Some of the new programs are being designed to prepare students for occupations which have become substantial opportunities only recently. A good example is provided by the work of the Technical Education Research Center in developing programs for biomedical and electro-optical equipment technicians (Dugger, 1968a, 1968b; Technical Education Research Center, 1967). Study of the needs of equipment users and producers identified new kinds of work for which a growing demand was defined. Analysis of the knowledge and skill requirements for the new vocations led to development of curricula which now are in pilot testing. Additional phases of the work will develop and test teacher education programs and extend similar developments to other technical areas. New programs also are being developed elsewhere in social service (Bezanson, 1968), recreation services (Berryman, 1968), nonprofessional educational jobs (Conant, 1968), justice (Dennard, 1968), allied health occupations (Barlow, 1968), and numerous other areas.

Many traditional programs are being revised to correspond more closely with current employment opportunities. An example is provided by the NOBELS project (Lanham, 1968) which is designed to develop and keep current a new secondary curriculum in business and office occupations. Data now being gathered on the performance requirements of current and emerging office occupations will be used to prepare a comprehensive set of educational objectives for which efficient learning conditions will be devised. A system for internal evaluation of learning units and for follow-up of graduates' performance and job requirements will provide corrective feedback to the curriculum.

These new and revised programs were relatively easy to select for development because the need for them was apparent from existing data or from information easily obtained. In the general case, however, the problem of forecasting changes in the job market and translating these forecasts into effective curriculum adjustments is a theoretical and methodological challenge of the first order. Both theory and methodology still are in a rudimentary state, but work has been undertaken to improve predictions of labor market demands and estimates of educational requirements (Kaufman & Brown, 1968). In addition, a start is being made in adapting system design and analysis methods to the problems of selecting and evaluating the effectiveness of vocational programs (Adams, 1968; Byram, 1968; Kaufman, Stromsdorfer, Hu, & Lee, 1967; McGivney & Nelson, 1969a, 1969b, 1969c; Mooney, 1968; Provus, 1967; Starr, 1967).

Though only beginning steps have been taken toward assuring that vocational education is responsive to occupational opportunities, the trend toward insistence on relevant curricula seems unmistakable.

Relevance for students' needs. A second major criticism by the Panel of Consultants on Vocational Education (1963, pp. 206-214) was that vocational education lacked sensitivity to the needs of many groups of students, especially those we would describe now as disadvantaged or having special needs. In most schools, vocational offerings were severely limited in variety and entrance standards often were as severe as for academic programs. Although this criticism probably would be justified even today, recent developments suggest that, in the future, more curricula will offer a broader range of educational and vocational choice and will accommodate the needs of many more students.

A large number of programs are under development or in tryout to provide vocational preparation for groups mostly ignored until recently, predominantly the disadvantaged. Many of these programs were developed to meet specific needs in individual communities and have limited possibility of general adoption. However, early information about some local, experimental programs seems to indicate that they could make substantial contributions to vocational programs for disadvantaged students in other locations. The programs developing in Compton, California (Zuck, 1968), the store-front schools of Minneapolis, the work-study programs of Warren, Ohio (Asbell, 1967, ch. 3), and the food, education, and service technology programs of the San Francisco Bay area schools (Batmale, 1966) are only a few examples. Such well-known manpower and antipoverty programs as those of the Manpower Development and Training Act, the Job Corps, the Job Opportunities in the Business Sector program and the Work Incentive System, also have developed some methods and materials which hold promise for application to vocational education of the disadvantaged in the public school setting.

Although the majority of curriculum work for special populations has been for urban, socially disadvantaged students, some other groups also have had attention. The Western States Small Schools Project, a cooperative enterprise of five states, has under development a vocational program designed for students in small, isolated, rural schools (Stutz, 1968). By combining a program in basic technology, an individualized sequence in career selection and decision making, and innovative methods for bringing vocational experiences to the isolated school students, it is planned that graduates will be able to complete their chosen vocational preparation in much shorter time at more complete facilities elsewhere, such as community colleges or residential vocational schools. Another project (Hensel & Johnson, 1967) developed techniques for individualizing instruction so that small schools which have no teacher with appropriate competence still may offer preparation in many vocational areas. Demonstration units in several off-farm agricultural occupations were developed and evaluated favorably in use.

Designing special programs for previously unserved groups certainly can improve the relevance of vocational education to the needs of students and provide useful means for dealing with special situations. A more general solution to the problem, however, might be to design curricula so that, within very broad limits, any student could enter the curriculum at a level justified by his capabilities. He could then proceed to acquire vocational capabilities in a sequence which prepared him for occupations within a family at successively higher levels. Such a program could accept virtually all students and provide each with vocational competence at whatever level his interests, abilities, motivation and time would permit.

Several programs have been undertaken with this kind of objective. The pre-engineering technology program, or Richmond Plan (Asbell, 1967, ch. 1), employed the basic concept, but limited entrance to students of at least average ability who were underachieving. Project FEAST (Baturale, 1966), an adaptation of the Richmond Plan to food, education and service technology, accommodates students at all levels of ability and provides a graduated sequence of occupational goals. The most comprehensive attempt to use this strategy is Project ABLE of the American Institutes for Research and the Quincy, Massachusetts, Public Schools (1964). Individualized curricula were undertaken according to this plan in 11 broad vocational areas involving over 200 occupations organized into more than 30 sequences. Preceded by a comprehensive program in occupational study and exploration, self-evaluation, and vocational decision-making, and by a course in basic technology, this curriculum should come close to meeting the vocational needs of all students.

The great diversity of curriculum programs attempting to respond more effectively to the needs of students suggests that no single method for accomplishing this is likely to prevail in the near future. The same diversity and the high level of activity directed to the problem also suggest, however, that the problem is considered important and that more future curricula will attempt to meet the needs of all students.

It is relatively easy to forecast that more vocational curricula will be responsive to real requirements of the labor market and to needs of students because these trends are evident in programs under development, demonstration or test. The trends toward more efficient integration of vocational and other curricula and toward preparation for greater vocational flexibility are less apparent, being in an earlier stage of development. Only a few early attempts to achieve these goals can be cited. No doubt, it will be some few years before curricula satisfying these goals are in common use because, in each case, achievement of the goal requires many adjustments in educational practices and in curriculum content and some developments in theory and methodology. Still, each has achieved a considerable degree of acceptance as a goal and work has begun toward solution of the numerous problems.

Integration with other curriculum elements. The notion that education should be preparation for life and that it should include preparation for work of some kind has been around, and hotly debated, for a long time. Now it seems that this conception has achieved enough acceptance to be advocated by numerous prestigious individuals and groups. Gagné (1965a) reports that a consensus of recommendations on the goals of education includes satisfaction in a life work or vocation, responsible citizenship, and participation in a variety of aesthetic experiences. Within vocational education, the need for more than just training for a particular occupation has been recognized for some time and the need for integration of vocational and other curriculum elements has been emphasized, especially recently. The Advisory Council on Vocational Education (1968, pp. 47-48) reported, "It is no longer possible to compartmentalize education into general, academic, and vocational components....Vocational education is not a separate discipline within education, but it is a basic objective of all education and must be a basic element of each person's education."

It is one thing to agree on an educational goal such as "preparation for life" or "an integrated curriculum." It is quite another thing to translate those goals into such operationally useful specifics as short-term objectives and curriculum materials, especially for goals as pervasive as this one. What kinds of curricula would provide students with the diversity of capabilities needed for successful, satisfying lives?

Attempts to provide more comprehensive, integrated programs usually have settled for less than the extensive analysis and development which seems required for a new curriculum. Probably, the widespread use of "related" classes in mathematics and science for vocational students could be considered an attempt at integration. Though related courses seem rarely to have had other than a vocational purpose, many students no doubt acquired capabilities there which were used in other areas of life. The introduction of team planning and team teaching to vocational education, as in the Richmond Plan (Asbell, 1967, ch. 1), provided a method for designing curricula in which students' learning could be integrated better across normal subject matter divisions and in which conditions could be established which better facilitated learning transfer. These methods and a host of other particular innovations by imaginative people can be taken as tentative, partial attempts to provide more comprehensive educational preparation for life. What they lack most is clear specification of objectives for the total curriculum and systematic development of educational means for achieving those objectives.

Two project examples originating in vocational education will serve to illustrate the kinds of development being undertaken in pursuit of the comprehensive curriculum. The strategy in each project is to start by translating broad curriculum goals into statements of performance capabilities desired of graduates. Collectively, these statements define the repertoire of capabilities judged essential for successful life performance. Each end objective for the curriculum then can be analyzed so as to identify a sequence of prerequisite learnings. Taken together, these sequences define all the learning required of students to achieve the capabilities defined as objectives of the curriculum. Since many prerequisite learnings are likely to occur in several sequences, the sequences can be combined and redundancies removed. A flow chart showing a student's route through the learning sequences would show many connections among sequences and describe a fully integrated, efficient curriculum for achieving the original goals. Methods and materials then can be devised to support the learning required by each item in the curriculum. This is a greatly simplified outline of the strategy used, but it may suggest how very large is the departure from usual practice and probable results by some new vocational curriculum projects.

In Quincy, Massachusetts, Project ABLE (American Institutes for Research & Quincy Public Schools, 1964), mentioned earlier in this paper, is developing a full secondary curriculum to accommodate all students not preparing specifically for entry to a four-year college program. The three goals of vocational competence, responsible citizenship, and self-fulfillment were analyzed, in general conformance with the method described above (Morrison, 1965), to derive sequences of necessary, prerequisite learnings (Morrison & Lecznar, 1966c). Learning objectives common to several sequences were identified and grouped to provide more efficient sequences of mathematics, science, basic technology, and non-technical vocational objectives. Individualized learning units (Morrison & Lecznar, 1966a) and achievement tests (Morrison & Lecznar, 1966b) were devised for the elements of each sequence making maximum use of available materials and facilities. Much of the curriculum, including a vocational guidance program (Hudak & Butler, 1967), now is in tryout and debugging prior to formal evaluation. Numerous difficulties were encountered in this effort (Morrison, 1968) and the resulting curriculum probably will be neither as complete nor as integrated as was intended. Nevertheless, it represents an encouragingly successful, pioneering attempt to build a comprehensive curriculum.

The second project using the strategy outlined earlier is called "Educational System for the 70's" or just "ES-70" (Bushnell, 1967; Bushnell & Rubel, 1968; E. F. Shelley & Co., 1968). It is a much larger and more ambitious undertaking by an organization of 17 school systems across the country in cooperation with the U. S. Office of Education. It is the purpose of ES-70 to develop a secondary school curriculum from which graduates will have four options: four-year college, junior or community college, advanced vocational programs, or gainful employment. Objectives for the curriculum, stated as performance capabilities to be acquired by students, are to be submitted by a variety of sources including vocational education and the academic disciplines. These objectives will be consolidated by new methods now being developed (Tuckman, 1968) to define the major structure of the trial curriculum. Detailed sequences and supporting methods and materials then will be developed in a number of large projects, tried in the cooperating schools, revised and made generally available. As in Project ABLE, learning assignments are to be prescribed on the basis of students' learning needs and progress is to be through mastery of assignments assessed by tests of achievement. Unlike ABLE, ES-70 provides a computer system for the large amount of bookkeeping involved in keeping track of and reporting on the status and prospects for each student. This project is in the early stages of development and faces many substantial obstacles. It is, however, important enough to justify our continued attention, being sufficiently large to involve and influence most of the significant purveyors of curriculum materials and sufficiently controversial to influence thought and practice in curriculum development.

Provision for vocational flexibility. A major problem in devising curricula to prepare students for life is that the requirements they will face in the future are likely to be different from those existing today. In the world of work, the demand pattern for human capabilities is changing especially fast so that individuals can expect to shift occupations several times during a working lifetime. It has become important that vocational curricula be designed to provide a useful basis for occupational versatility. The problem is to identify the capabilities which will provide such a basis for a future which is not accurately known.

To date, the most common strategy has been to examine today's occupations for common requirements and include preparation for these in the curriculum (Sjogren & Sahl, 1966). Often, this procedure leads to the identification of groups of occupations sharing a number of requirements and to curricula designed to prepare students for a cluster of related occupations. Study of this kind has been directed to such groups as, for example, technicians (Schill & Arnold, 1965), office workers (Perkins, Byrd, & Roley, 1968), building tradesmen (Bakamis, Kuhl, Hill, Swarthout, & Nish, 1966), construction workers (Frantz, 1967), and agriculture and metal workers (Sjogren, Schroeder, & Sahl, 1967). Requirements other than specific job skills and knowledges sometimes are identified in such studies as common to many occupations (Morrison, 1967).

Significant methodological and theoretical problems are faced by attempts to identify common requirements in existing jobs or to provide preparation for a variety of job opportunities. Perhaps, the most fundamental problem is the lack of adequate systems for classifying human performances. At present, it is difficult to assert that two real-life tasks are the same or equivalent or that learning one vocational capability will facilitate learning or performance of another. Some beginnings have been made on the development of taxonomies which have implications for education (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956; Gagné, 1965b; Krathwohl, Bloom, & Masia, 1964; Melton, 1964) and Fleishman (1966, 1968) has undertaken the development of a behavioral taxonomy for describing tasks using a combined correlational and experimental approach. At this moment, however, curriculum development for vocational flexibility must proceed under a considerable handicap.

One interesting attempt to define generalizable capabilities which may go beyond the specific requirements of current jobs is that of Altman (1966) who found an orderly content dimension underlying specific behavioral requirements of 31 diverse occupations. This continuum, together with a hierarchical system of psychological process, provided the basis for a process-by-content definition of the domain of vocational capabilities. It describes, in two dimensions only, the ways in which jobs can differ or be alike and, therefore, is a much more comprehensive basis for curriculum development than are the usual cluster studies.

Implications for Guidance and Counseling

It would be difficult to overstate the importance of all this for guidance and counseling. Obviously, in the near future, vocational guidance will become a much larger task than it has ever been. The demand for all kinds of vocational information, for evaluation of students' interests, abilities and aspirations, and for counseling with students about their educational and vocational options and decisions must increase substantially and command a much larger portion of the total guidance and counseling effort. As this happens, it seems clear that it will be necessary to find new techniques and new methods to get the guidance job done. Vocational guidance is by nature a more complex task than other kinds of guidance in the school setting because the number and variety of options is larger. Consequently, there is more educational and vocational information to relate to an individual's characteristics, needs and aspirations. Probably, such innovative developments as those of Tiedeman (1968), Cogswell (1966), Flanagan (1967), Impelliteri (1968) and others (Minor, 1967) will be an operational necessity by the time they can be readied for use. Even with the introduction of new technology, it surely will become necessary to follow Campbell's (1968) suggestion and to introduce system design and analysis procedures to the total guidance problem. This would require selection of some among the many possible objectives for the system and development of efficient methods for accomplishing sets of possible objectives. If this is done, then it seems certain that there will be at least some redefinition and differentiation of roles in the guidance program for counselors, teachers, administrators, paraprofessionals, and others outside the educational institution. Very probably, the preparation of guidance and counseling specialists will need substantial revision if it is to prepare people for new methods, new tools and techniques, and new roles. Finally, with vocational education so obviously under revision and expansion, it behooves the guidance and counseling profession to intensify its efforts to work with vocational education to develop effective total programs. The Interdivisional Commission on Guidance and Vocational Education, sponsored by NVGA and ASCE and chaired by Ted Cote, is a good start at the association level. I understand that a book on guidance and vocational education is being developed under joint sponsorship of APGA and AVA and that, too, will help. But I would encourage attempts at rethinking and cooperation at local and state levels as well.

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Testing for Vocational-Technical Training Programs

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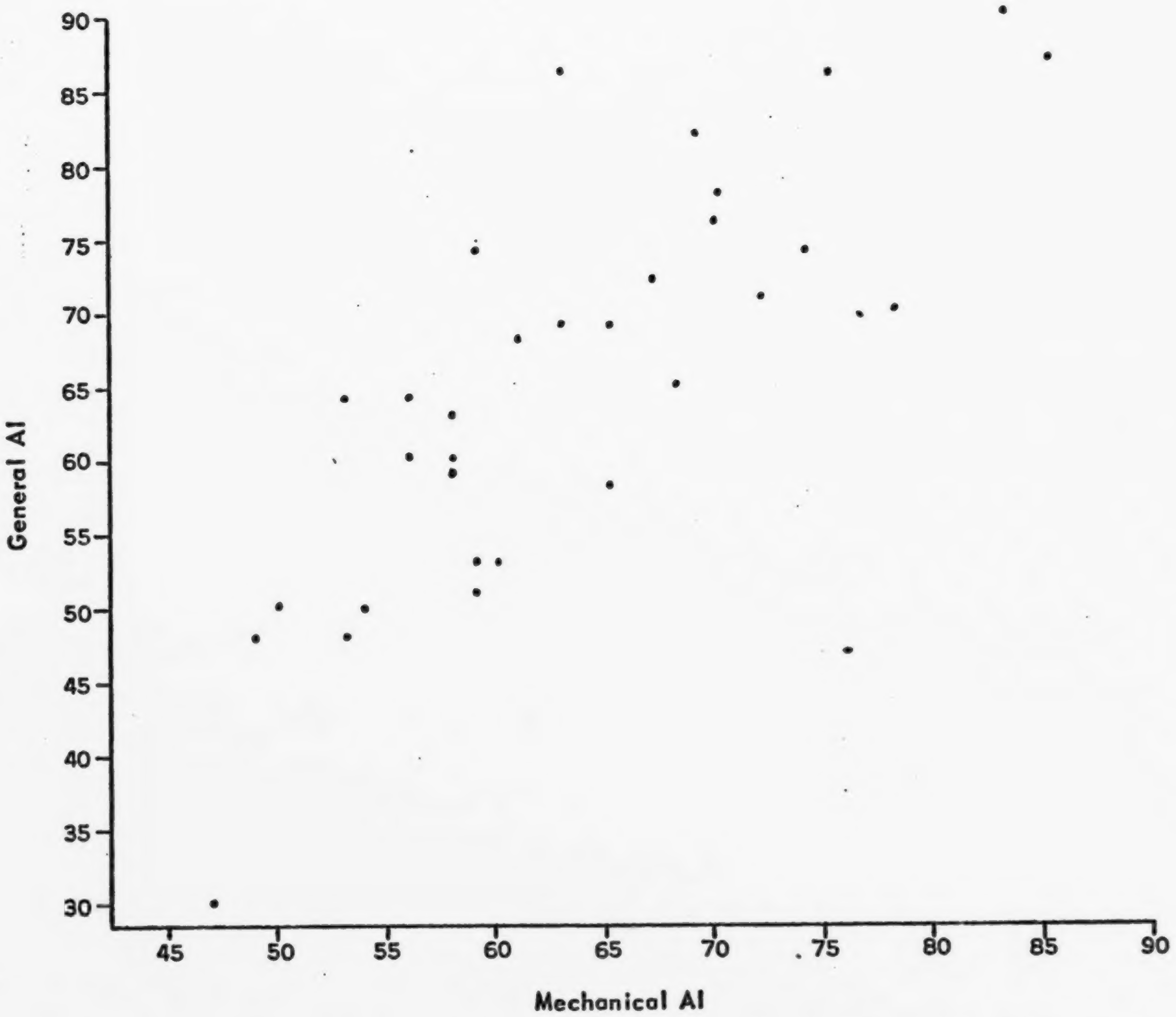
Today I propose to talk briefly about research effort in the area of psychological testing which may have implications both for the work of the test research psychologist and of the counselor. Traditionally, the test psychologist's goal has been to devise tests and procedures which allow for the best possible predictions about the individual's chances of success in particular job areas. On the surface this appears compatible with the goals of the counselor, who must guide young people into those choices which are, in the long run, best for them. Test psychologists generally have done a commendable job of achieving their goal. Granted, occupational choices predicated solely on test date give less than perfect results. But, wisely used tests allow for vocational decisions that are appreciably better than chance.

However, any psychologist who has coped with the problems involved in allocating men to jobs in large scale personnel systems quickly becomes aware that the conventional test prediction model does not really fit the model inherent in the counselor's task. This is not to say that test data is useless to the counselor, but rather that it is not as useful as it could or properly should be. Traditionally, it is assumed that a linear relationship obtains between well constructed tests (or composites) and training or occupationalsuccess; generally, such relationship has been found between test scores and success in training.

Useful knowledge about relationships between test data and job performance is almost non-existent (in part because of poor criterion information). While the classical prediction model is linear and normative, the model with which the counselor must work is ipsative; the counselee must be compared, not exculsively with other counselees, but with himself as well.

It is important that normative information be available to the counselor so that he may see how this individual compares with others in the population. Classical test instruments do an admirable job of providing this information. Clearly, a counselee would not be counseled for occupations for which he possesses none of the prerequisite abilities. However this information is useful primarily in allowing the counselor to limit the number of occupations to which the individual should give serious consideration. In other words, it primarily serves a screening function. A couple of things are obvious about tests and classification techniques. Tests of different abilities tend to correlate with one another. Those individuals who demonstrate a high performance on measures of one ability tend to demonstrate equally high performance on measures of other abilities. Consequently, test data provides a relatively weak basis for differential decisions. In the classical prediction model, it is assumed that a test's chief function is to identify those individuals most likely to succeed at a given job; thus, strict empiricism demands that the required number of the best qualified applicants be



Comparison of Mean General AI and Mean Mechanical AI Performance for 31 Male Occupational Groups. (Note: Subjects were tested as high school seniors; occupational group memberships were determined 5 years later.)

selected, and that remaining applicants be rejected. But essentially the same people turn out to be those who are "most qualified" in all job areas. The counselor cannot advise certain young people that any number of jobs are available to them and discard the remaining counselees. Over the last few years a great deal of attention has been focused on precisely this problem.

The handout provided you graphically points up these problems. These data were taken from a five-year follow-up study of Project TALENT cases. In the Project TALENT study, over 400,000 students in a representative sample of U.S. high schools were tested on a broad spectrum census test battery in 1960. Periodic follow-ups of these students are being conducted. Data shown in the figure are taken from an earlier study in which special composites of Project TALENT test variables were established such that they replicate scores on the Air Force's Airman Qualifying Examination, and from occupational data obtained in the 5-year follow-up of these students. The values shown along the two axes of the plot represent percentile score values on estimates of student performance on the AQE General and Mechanical aptitude indexes. The plotted points show average performance on these two measures for boys who were tested as high school seniors and later entered specific occupations. Each point represents one of the occupational groups. While this figure shows a comparison on only two of the four aptitude indexes, other possible comparisons are very similar to it. It can bee seen from this figure that occupations which attract sutdents of high ability in a relevant area pull off the upper range of ability in other areas. This may be attributed in part, to the correlation among predictive composites.

These considerations have led me to the conclusion that selection (or screening) and classification are, properly, two separate, uniquely different functions which are properly handled by different models. In my view, most psychologists have never really conceptually differentiated between selection and classification functions, with the result that most psychometric studies have been, in reality, selection studies directed toward classification problems. This may account for the fact that during the past couple of decades only very small improvements have been made in test utility. During this time a number of different techniques and measures have been investigated as possible contributors to predictive validity; and, during the past couple of years psychometric investigations have tended more toward development of differential classification models. A brief review of some of the psychometric research from the past few years should clarify the present state of the art, and suggest those lines of attack which are likely to prove most productive in the future.

In a series of studies, Judy (1962a, 1962b, 1962c, 1962d, 1962e, 1962f, 1965, 1966) has demonstrated the utility of educational background data in predicting success in technical training courses. Generally, educational data contribute to prediction over and beyond the level achieved with aptitude test measures, and while the gains in predictive effectiveness are not large, they are large enough to be of practical value. As a result of these studies, the Air Force, for the past few years, has used simple data on successful completion of certain high school courses in computing its aptitude composite scores. Utility of these simple educational variables has been confirmed by Tupes, Bottenberg, and McReynolds (1967) and by later unpublished analyses by Valentine. A number of years ago, Gordon (1955) demonstrated that enhanced prediction of technical training success is achieved when the student's geographic region of origin is taken into account. Essentially her finding was that young men from certain geographic regions perform considerably better in technical training than one would predict from their test score composites, whereas youn men from other regions perform more poorly. The young men in her samples were separated into subsamples on the basis of their geographic region of origin. She found that generally the selector test composite demonstrated higher validity within these regional subgroups than was obtained from the pooled national sample. Moreover, when she applied the prediction equation based on the national sample to the regional subsamples, it inaccurately predicted average training grades within the regional groups. For example, for a clerical course she found that the clerical composite stanine underpredicted course grade for youn men from the south, whereas those of young men from the northeast were considerably over-predicted. In comparing these two regional subsamples she found that a clerical composite stanine difference of about $1\frac{1}{2}$ points was associated with the same course grade performance in the two groups.

In a more recent study Tupes, Bottenberg, and McReynolds (1967) found evidence that prediction of success in Air Force technical training courses is enhanced by allowing separate prediction composite equations to operate for students from the various geographic regions. Aside from agreeing with the findings of the Gordon study, this further suggests that a single composite equation does not as effectively predict success as do differing equations predicated on geographic region. This same study demonstrated, again, that more effective predictions are achieved when a separate prediction composite is used for each course.

It is of interest that, while these studies have suggested that small gains within the context of the classical prediction model are possible by the addition of a few educational variables, or through use of background data as moderators, the gains are modest. Moreover, the number of variables that must be dealt with, and complexity of composite score computation increase appreciably. It has geen a general feeling over a number of years, that paper-and-pencil aptitude tests fail to predict success or failure for the culturally disadvantaged; primarily because most paper-and-pencil tests are highly loaded on verbal factors. It is generally reasoned that the disadvantaged have developed their reading skills at a very low level; consequently, their test performance does not represent their true ability. This has resulted, over the past few years, in a number of studies aimed at finding better predictors for use with disadvantaged groups. The feeling is sometimes expressed that measures discovered for these groups may in turn be useful with all examinees. While a great deal of research in this area has been started over the last few years very little is available at this time in way of solid, useable results. However, a 1965 paper by Dvorak, Droege,and Seiler outlines the research approach that is being taken to such problems within the U.S. Employment Service. Since their research effort is being conducted on a fairly large scale, it should be of general interest. It does represent one attempt at enhancing the utility of aptitude examinations by including examinations appropriate for a segment of the population usually ignored in test development activities. The Employment Services' recent program of research begins with development of a simple screening procedure for determining whether the applicant is capable of taking the usual sorts of aptitude tests. Their principle requirements for such a screening procuedure were that it be simple to administer and score, that it require no more than 10 minutes of the examinee's time, that it provide objective scores, and that it differentiate between those who could and those who could not take tests of the general aptitude test battery in its present format. In their studies, they found that a very short test instrument composed of the sample items on the GATB vocabulary and three dimensional space tests screened out those subjects who could not provide valid scores on the entire battery. Later phases of the Employment Service studies involved development on non-reading versions of the General Aptitude Test Battery, which included such variables as orally presented vocabulary tests, coin series tests, and simple matching tests. Later phases of the research program involved consideration of appropriate norms for the tests and follow-up of examinees through MDTA training and validation of the test instruments developed. While such studies will perhaps serve a useful purpose and may make it possible to much more reliably assess the abilities of individuals with low reading ability it must be recognized that their utility will be limited; gains in predictive efficiency through them will be limited in scope. Other interesting research during the past few years has dealt with the utility of job preference information in arriving at career decisions. Early in the history of vocational interest measurement ratings of preferences among job titles were used with some degree of success. The more formal job interest inventories came into being on the assumption that most young people do not know enough about the various jobs available to them to express an intelligent preference among them. Consequently, the inventories were designed to elicit information about likes and dislikes which, in turn, could be used to provide information to the counselee about those jobs in which he appeared to have the greatest interest. Meaningful job preference information should have considerable utility in counseling and guiding young people in their career choices; however, studies in the area of job preferences have generally demonstrated modest predictive validity, but have tended to ignore the question of meaningfulness of the information elicited from young subjects. In one recent study, Norman and Bessemer (1968) investigated the question of meaningfulness using forty jobs selected from the dictionary of occupational titles. In their study, they were investigating the form of stimulus presentation that could elicit the most meaningful information from young people. Their forty job sample consisted of ten familiar professional jobs, ten unfamiliar professional jobs, ten familiar skilled labor jobs, and ten unfamiliar skilled labor jobs. For each job, a brief job description was prepared which described the nature of the job; moreover, their design then was established such that preference ratings for the four job groups could be compared under job title presentation as opposed to job description presentation when no title was given. Each subject in their study rated each of the forty jobs on two separate occasions with a one month time interval between the ratings. In this was they were able to evaluate shifts in preferences across time when jobs were presented in the same stimulus form on both occasions or in a different stimulus form on the two occasions. They found that essentially there was no difference in preferences between professional and skilled jobs when they were rated as descriptions, but that there was a considerable difference between them when they were rated as titles. Moreover, preference shifts were clearly larger when the cue form was changed between the two sets of ratings and this effect was more pronounced for unfamiliar than for familiar jobs. From this it might be concluded that use of job descriptions is effective in reducing bias toward prestige level of the job; consequently, it would seem that more meaningful preference data may be obtained from the descriptive cues than from titles used as cues. This should have considerable implications for the form in which interest data is collected for use in counseling and assignment. Over the past few years, a number of researchers have questioned the future utility of the classical prediction model if further gains in the solution of personnel classification problems are to be made. In an interesting recent paper Wernimont and Campbell (1968) have proposed the substitution of a "behavioral consistency model" for the classical prediction model in solving personnel and counseling problems. Such a model requires that the researcher first gain an understanding of the components of a job and then focus his attention on a search for relevant past behaviors which might be viewed as samples of the job tasks or, in their absence, the development of work sample tests and that he then engage in longitudinal follow-up studies designed to assess the extent to which these past behaviors and work samples do in fact predict job performance.

Such a model hinges on the oft mentioned but relatively untested idea that the best indicator of future performance is past performance. Consequently, it would follow that samples of past behavior relevant to a particular job, or special assessments of ability to perform job relevant tasks, should be the best predictors of job performance. On the criterion side it would be necessary to seek out those elements of effective job performance which appear to be relatively consistent across time. Such an approach to vocational prediction would imply the necessity for development of different class of predictor measures from those traditionally used in prediction work. In another recent paper, Lunneborg (1968) opened with the following observations: "the investigator developing a battery of measures for predicting each of a number of criteria is confronted with a choice of two basic models. He can elect either absolute prediction choosing predictors to achieve the highest average correlation across criteria or differential prediction choosing predictors to best account for differences among criteria. In the first instance, selected predictors share variance with whatever is common among criteria while in the second, predictors share variance with what is unique among criteria." In his study, he explored the hypothesis that the predictors selected under these two models would be quite different. As criteria in his study, he used freshman grade point averages in twelve separate academic areas. From his analyses, Lunneborg did find that, in fact, different predictor variables are needed in the two models. His conclusions stated in part: "Indeed biographic data are more important in making differential predictions of academic achievement than in making absolute predictions. The latter relied much more heavily on measures of prior academic achievement. That is, while biographic information is not predictive of what is common to success across course areas it is essential to explain why a student may succeed in one area and fail in another; or if he is likely to succeed in all areas, why achievement could be greater in one area than another. Where predictions are used by the individual, the variability inherent in biographic data permits better choices among competing criterion activities." He also noted that correlations of the batteries selected for differential prediction with the various criteria tended to be lower than those of the battery selected for absolute prediction, but pointed out that the accuracy of the absolute model was sacrificed for the greater utility of differential prediction in personal decision making.

Doerr and Ferguson (1968) have recently investigated the utility of a multiple discriminant statistic in differentiating among eight vocational-technical curricular groups in the Missouri public schools. They found the multiple discriminant statistic based on aptitude, and interest data to be highly useful in discriminating among the eight groups with which they were working. They found, for example, that classifying subjects in their equation construction group on the basis of each subjects highest group membership probability resulted in correct classification of 48 percent of them. When these equations were applied to a cross validation group use of the largest probability resulted in correct classification of 47 percent of the cases, suggesting that the discriminant equations were stable. They concluded: "In view of the findings of the present study it seems safe to conclude that discriminant equations can be generated which will aid in classificiation of vocational-technical students according to group resemblance by using aptitude and interest variables. Therefore, the multiple discriminant function statistic could be considered an appropriate technique to aid in the guidance and classification of secondary school vocational-technical students. The statistic is certainly a useful technique to meaningfully combine available psychometric information."

Their recommendation regarding use of the data in counseling students enrolling in vocational-technical training was that the student be counseled on the basis of his two or three highest probabilities of group membership.

These studies suggest considerable dissatisfaction with the classical test prediction model and with the typical form and content of test instruments. Certainly I would agree that there appears to be little hope for appreciable further gain in utility of test data within the context of the traditional prediction model.

Much of my own thinking about these problems has been set in the context of data requirements for a military assignment system, but which, in the final analysis, is very similar to requirements for a good counseling data system. I do not believe that the present psychometric state-of-the art would permit implementation of a revised system incorporating changes suggested by recent psychometric literature. Consequently, a well coordinated long range research effort is needed if future gains are to be achieved.

While one cannot elaborate all details of a research program in the time available here, a few comments about it should indicate something of the direction I believe future psychometric research must take, and should clarify intended uses.

First, it is essential that both psychometric researchers and counselors should better distinguish, both conceptually and in practice, between "selection" and "classification" functions. Conceptually selection might be viewed within the context of the classical prediction model; its major function is to allow for predictions about probability of success or failure in various broad occupational areas. Its major function should be to establish minimum levels of ability required if the area is to be given further serious consideration; a secondary function could be to further limit the number of jobs within the area for serious consideration.

Classification, on the other hand, should focus on background, experiences, interests, training and capabilities that make the individual more uniquely suited for one job than for others. Emphasis here should be on differences among jobs rather than on absolute prediction. What is needed, ultimately, is development of test or survey instruments based on careful, detailed analysis of job requirements, which tap biographic information related to experience with, interest in, or ability to quickly learn important job elements, as well as controlled performance samples. This may well entail considerable effort directed toward development of homogeneous scales of biographic, experience, and interest dimensions; and techniques for individual performance assessment. Since the goal of classification is to arrive at the best possible job decisions for individuals, the differential model would be the preferable one. Analysis of individual assessment data should ultimately result in statements about the probability that the individual is like those who are successful, satisfied workers in various jobs. With such probability statements, the counselor would be better able to advise the student about those occupations for which he appeared best suited. Organizations constrained to classify, train, and employ large numbers of people could design their assignment procedures to maximize these probabilities.

In refocusing the direction of classification research, it will be highly important that we avoid artifactual research outcomes. We live with the ever-present danger that those measures which distinguish among groups are effective simply because of the way we have assigned, or counseled, individuals in the past. Thus, it would seem important that, in conduct of research, we study some groups assigned to jobs without regard to the usual criteria.

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INPUTS TO VOCATIONAL-TECHNICAL EDUCATION FROM OCCUPATIONAL RESEARCH

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I'm sure most of you realize that the Air Force and the other military services have been conducting research for over 25 years in the areas of personnel selection, classification, and training. Until recently, however, behavioral scientists have paid little attention to individuals once they have left training and settled down in their first job assignment. We give a man an elaborate set of tests and help steer him into an occupational area. But our tests have been designed to maximize his chances of successfully passing the initial training course. We have not collected detailed follow-up information concerning the types of work he is assigned to do; how well satisfied he is with his job assignments; which tasks he does well; and which ones he has difficulty in performing. The military services have conducted hundreds of studies on teaching techniques. We now know "how to teach." But, until recently, we have not concerned ourselves with researching the question of "what to teach." Curriculum development is an art, and this art often has been practiced in the absence of detailed information about the jobs individuals are likely to encounter in the operational world. At best, course elements have been based upon relatively global job descriptions written by job analysts who study a limited number of jobs. Once a curriculum has been established, changes are introduced slowly, and then only when recommendations for such changes are received from users. These recommendations are generally for training on new tasks, or for more training on difficult-to-perform functions. Seldom is there any information from the field indicating what training can be eliminated or abbreviated. Thus, the pressure is always for more courses and longer courses.

Now I am going to hazard the guess that those of you working in the areas of vocational training and vocational counseling are faced with somewhat the same problems. I doubt if you get a great deal of feedback information from your graduates, once they have left the school setting. I would guess that curriculum experts could use more detailed information about the jobs your graduates are likely to encounter in future years. I would guess that the pressures are always for more training, and that there is very little information concerning what would be the effect of dropping or curtailing course content. I would guess that the tests you use for helping students make career choices have generally been developed and validated against academic grades. Finally, I would guess that your students have many specific questions about the specific details of jobs which they do not even bother to ask, because they know you are not likely to have the answers.

In recognition of the need for more information about the work world, about 10 years ago the Air Force established an occupational research project. Mr. Lecznar has asked me to describe to you some of this research, and to indicate a few of the applications it may have for vocational training and vocational counseling. First, let me say that I claim no expertise in the areas of vocational training or counseling. However, I recognize that people are people, wherever you find them, and that there are enough similarities between jobs in the military services and jobs in the civilian sector to indicate probable transferability of many of the results.

I will concentrate on describing the techniques we have developed for collecting, analyzing, and reporting occupational information, because good occupational information is the beginning point for occupational research.

After studying Air Force needs for occupational data, we soon came to the conclusion that occupational surveys using task inventories were most likely to meet our objectives. First, the technique is economical. Data can be collected using task inventories from thousands of cases throughout the world for less than it would cost to collect data on a few cases using trained job analysts. Second, the information is quantifiable. That is, you can actually count the number of people that perform any given task, and describe their characteristics. Data collected by job analysts are not quantifiable. No two analysts will describe a job in exactly the same terms. The fact that information collected with task inventories is quantifiable means that it can be stored, manipulated, analyzed, and reported by computer. The fact that it is quantifiable also means that it can be subjected to research --- that is, it can be validated and checked for stability using conventional statistical techniques.

During the last 10 years, the Personnel Research Division of the Air Force has conducted scores of studies on how task inventories should be constructed and administered, and on how the resulting information can be analyzed and reported to answer the questions most often asked about jobs.

Now let me describe a task inventory to you. A task inventory contains two sections. The first section is composed of background questions to be answered by a worker concerning his job and himself --- questions relating to previous education, time on-the-job, tools utilized, equipment worked on, interest in job, felt utilization of talent, pay grade, and so on. For jobs in the civilian sector one might wish to include questions about union membership, size of company, number supervised, products manufactured, fringe benefits, time with company, and job location. Current analysis programs permit inclusion of up to 928 background information questions in an inventory. The second part of an inventory is simply a list of the significant tasks performed by workers in a single vocational career ladder. That is, it contains tasks performed by apprentices, journeymen, 1st-line supervisors, and superintendents working in a single occupational area such as metal working, automotive repair, or firefighting. If this task list is properly constructed, then every job performed by workers in the occupational area should be definable in terms of a subset of tasks in the inventory. In the Air Force we find that 400 to 600 task statements are usually adequate for this purpose.

An initial task list is constructed from available published sources, which, in the civilian sector might be the Dictionary of Occupational Titles. This list is then subjected to an interview - review by subject matter specialists, and to a mail review by one hundred or more supervisors working in the field. Based on this information, the final inventory booklet is published and administered to a representative sample of workers in the occupational area. A worker provides identifying and background information, checks the tasks he performs as part of his normal job, and writes in significant tasks which are not listed. This write-in feature is important, since it makes the instrument self-repairing. The worker also indicates how his worktime is distributed across the tasks in the inventory. The completed booklet is sent to a central agency, where the data are keypunched or read by an optical scanner, in readiness for computer analysis.

Before describing the types of data analyses which can be accomplished, I should point out that we have conducted many studies to determine the quality of information collected with task inventories. We know that when a worker fills out an inventory on two occasions, he gives essentially the same information both times. Supervisors agree with the information provided by their subordinates. Information collected with daily work records is consistent with information collected with inventories. Workers do not inflate their descriptions in terms of the number or difficulty levels of tasks reported. There is a high probability that significant tasks missing from the inventory will be written in by workers who perform them. In summary, we feel we get quality information using task inventories.

In the Air Force, we have already collected and analyzed occupational information from over 100,000 cases in a variety of occupational areas. The data have been so useful, we are now contemplating establishment of an occupational data bank containing job information from workers in all areas, and we are looking forward to the time when we will maintain data on every person and every job in the Air Force. The Army has already begun establishing a similar data bank, - - - and the Navy, Marine Corps, and Coast Guard are finalizing plans to go in the same direction. The Canadian Forces have surveyed about half of their occupational trades, and the Australians are thinking about adopting the Canadian System. The Public Health Service has surveyed its professional jobs using task inventories. It seems obvious that there is a rapidly growing movement in the direction of establishing occupational data banks, and I predict that this movement will soon take hold in the civilian sector.

Now it should be recognized that so much data is available in an occupational data bank, no one could possibly become familiar with all of it. Nor would it be feasible to publish reports which would answer the questions individuals might have about jobs, even in a single occupational area. The new concept is to develop an occupational information retrieval system which will quickly select and report information relevant to each specific question as it is asked. We have developed such a system in the Air Force, and have been making daily use of it for several years. Today, I will describe a few of the retrieval programs which are already available, and will illustrate by example how they are used.

First, we have a program which will compute and publish a consolidated description of the work being performed by any group which can be defined in terms of the background information. For example, in the Air Force we may wish to see a description of the work being performed by men in an occupational area who have been on the job less than one year; who are working at overseas locations; who have been in the Air Force more than three years but less than seven years; who feel that their talents are not being utilized, or who find their jobs dull. Such a description could be obtained almost immediately. In the civilian situation, one might wish to see a description of work being performed by graduates of vocational high schools; working in a particular industry; in a given geographical area of the country; who have been out of school less than one year.

I have passed out an example group job description to give you a general idea of what one looks like. This one happens to be one for Air Force Medical Laboratory Technicians working at the journeyman level in hospitals and clinics throughout the world. Every task performed by members of this group is listed, and information is provided concerning the percentage of cases performing each task, as well as the amount of worktime spent on it.

Notice that a description like this provides information which is ideal for use in curriculum development. If one were developing a course for medical laboratory technicians, he certainly would want to include training on those tasks which appear at the top of this description. These are the tasks which the graduate is most likely to encounter on the job. On the other hand, it is questionable whether training should be given on many of the tasks listed near the bottom of the description. For example, only about one and one-half percent of the workers in this field are required to perform serum magnesium tests using biochemical procedures - - - whatever that means. Even these workers spend less than four-tenths of one percent of their worktime on this activity. When training time is at a premium, this is the type of content which can best be eliminated from the curriculum.

Returning to the information retrieval system, you can ask for a description of the work being performed by any group of special interest.

Perhaps you would like to know more about a group than simply the tasks that they perform. Fine! Another program will compute and present a detailed description of the background information available on the group. Provided such questions are included in the survey questionnaire, the report will summarize salary data, union membership, job satisfaction, educational background, tools utilized, equipment worked on, travel required, number of individuals supervised - - - or any other data that is available in the data bank.

Perhaps you wish to study the differences between two groups. For example, you might wish to know the differences in the types of jobs performed by graduates from vocational high schools and graduates from academic high schools, who are working in a given occupational area. No problem. Programs have already been written which will compute separate descriptions for the two groups of interest, compare their jobs, and present a consolidated summary of differences in work being performed.

Again, you may wish to know something about career progression in an occupational area. A program is available which computes the percentage of individuals at each experience level who perform each task in the inventory, and then presents this information in an easy-to-read format. A student can study this report to determine the types of tasks he is most likely to encounter when he goes to his first job. He also can see the tasks which are likely to be added to his job as he gains more experience. A vocational high school may wish to center its curriculum on those tasks which tend to be assigned to employees during their first few years on-the-job. In the Air Force, we have found that training must be timely, if cost effectiveness is a consideration.

Instead of studying the percentage of individuals at each of several experience levels who perform various tasks in the inventory, you may wish to determine the percentage of individuals in each of several industrial settings who perform such tasks. The same retrieval program can provide this information.

Instead of seeing a consolidated description of the work being performed by a class of workers, you might like to study all of the jobs in that class, one at a time. No problem. You define the class of jobs you wish to study, tell the computer whether you wish to see all of them or a representative sample, and push the button. The computer prints out descriptions, one at a time, for each individual worker's job, until it has met your specification.

Of course, this last program could quickly fill up the room with paper if one were not conservative in his request. For this type of data, display on a cathode-ray tube would probably be more efficient. A hard copy of any particular description could be published if specifically requested.

We all know that there are many different types of jobs in most occupational areas. For this reason, a group job description does not define very well the work performed by any particular individual in the group. Yet, one would hate to look at every individual job, when what he really wants is a description of each type of job that exists in the occupational area. We have a program which computes the similarity of every job with every other job in an occupational domain, groups similar jobs into clusters, and then publishes a consolidated description for each cluster. When we apply this program, we find that many types of jobs exist in some occupational areas. In the Air Force, for example, there are fifty-five distinct job types in the Accounting and Finance area. We have defined each of these types of jobs, and can provide information concerning the number of individuals working in them; the characteristics of these individuals; and the geographical location of their jobs. The job-typing program is very sophisticated. It may evaluate as many as three-and-one-third billion job combinations in arriving at the best set of job clusters in a single occupational area. We now accomplish analyses of this type on a routine basis.

I won't bore you by describing any more of the available information retrieval programs. However, you should be aware that the programs I have described are not a promise for the future. They are already fully developed and have been operating for several years. One of these days I would hope that an occupational data bank will be maintained by the Department of Labor and that vocational counselors will have access to a remote inquiry station hooked into a time-shared computer. When that time arrives, you will have a new service you can provide to your students.

Now let me quickly move on to a few other areas which might be of interest to you. First, since all of the jobs in an occupational area can be defined in terms of subsets of tasks in a task inventory, this inventory becomes an ideal framework for maintaining individual experience records. The Air Force does not currently maintain experience records at the task level, but we hope to in the near future.

In the civilian setting, an individual could also maintain his experience record in terms of the tasks in an occupational inventory. This would solve the serious problem that people now have in communicating their experiences and background to potential employers. A potential employer could immediately relate such information to his needs, since his job openings would be definable in the same terms. To turn the matter around, the potential employer could define his job openings in terms of the same set of statements - - - thus communicating in precise terms to potential employees the nature of the jobs to be filled. It might not be too far fetched to suggest that the beginning of a background and experience record for an individual could be in terms of training given by a vocational high school.

One of these days, the time may come when all job openings are defined and fed into a central data bank. Mobility is getting to be a matter of routine, and an individual looking for employment should have information concerning job opportunities, wherever they exist. An information retrieval system hooked into a data bank of this sort has interesting possibilities. One could seek out the jobs matching his interests and experiences, which exist in specified geographical regions. Scientists having access to the same data bank could determine skill demands at the task level - - - which might have implications for vocational training curricula.

When a task inventory is administered to samples of workers in an occupational area every few years, a comparison of jobs across time can produce useful information. For example, by comparing the number of workers performing tasks at time 1 against the number performing them at time 2, one can identify those tasks which are dying out, and those that are appearing more often in jobs. Such information would be of utility in keeping curricula up-to-date. If an inventory could be administered to the same sample of workers at two points in time, then one could determine the flow of individuals from each type of job to every other type of job; from one salary level to another; from one part of the country to another; and so on.

In the Air Force we are now routinely collecting data on job interest and felt utilization of talent. Because of this, we are in a unique position to research the impact of work assigned on job attitude and morale. We can already present evidence that there are distinct differences in the work being performed by individuals who feel misused and dissatisfied compared with the work performed by those who are happy - - - even in the same occupational area. We currently are conducting studies to determine aptitude levels above which individuals feel under-utilized in specific job types. Such data could be useful to counselors in helping students to identify job areas which are likely to prove unchallenging. On the otherhand, employers need to recognize that low aptitude employees are apt to be happier and more productive in certain types of jobs.

There are many other types of studies we are conducting in the Air Force which might be of interest to you. For example, we have developed a quantitative procedure for evaluating the difficulty level of jobs; we have developed a method for establishing the qualification requirements for jobs; we are making progress in the area of performance evaluation; we are studying the perishability and transferability of skills; we have studies going on in the areas of job engineering, and utilization of low aptitude employees. But I see that my time is gone, so I guess I'll have to wind up. I realize that some of the things I have described may seem a little futuristic in terms of resolving your problems today. However, I do feel that both students and schools need and deserve better information about the work world, and I hope some day to see it available to you.

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                                                                    SPC003 PAGE    1
JOB DESCRIPTION FOR AIRMEN IN MEDICAL LABORATORY CAREER LADDER AFSC 904X0

TASK JOB DESCRIPTION,CASES= 619,TASKS= 301,DUTIES=  17,MBRS= 394
AIRMEN WITH 90450B DAFSC
TIME PERFECTLY DESCRIBED ON DUTIES=  71.70,TASKS=  55.44

                           CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.......
                           AVERAGE PERCENT TIME SPENT BY ALL MEMBERS.................      .
                           AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING....      .      .
                           PERCENT OF MEMBERS PERFORMING................      .      .      .
                                                                    .      .      .      .
D-TSK                      DUTY/TASK TITLE                          .      .      .      .

F   18 COLLECT BLOOD SPECIMENS DIRECTLY FROM PATIENTS            93.40   1.70   1.58   1.58
J    3 PERFORM BLOOD COUNT                                       89.09   1.56   1.39   2.98
J   17 PERFORM HEMATOLOGY PROCEDURES FOR DIFFERENTIAL CELL COUNTS 88.83  1.49   1.33   4.30
J   24 PERFORM HEMATOLOGY PROCEDURES FOR HEMATOCRIT TESTS        89.09   1.45   1.30   5.60
N    2 EXAMINE URINE SPECIMENS MICROSCOPICALLY                   88.07   1.43   1.26   6.85
J    5 PREPARE BLOOD SMEARS                                      89.85   1.39   1.25   8.10
F   10 PREPARE AND PROCESS SPECIMENS                             87.56   1.39   1.22   9.32
N    9 PERFORM URINALYSES FOR GLUCOSE TESTS                      87.82   1.38   1.21  10.53
N   15 PERFORM URINALYSES FOR SPECIFIC GRAVITY TESTS             87.06   1.38   1.20  11.73
N    6 PERFORM URINALYSES FOR ALBUMIN TESTS                      87.06   1.36   1.19  12.92
F    3 CLEAN AREA AND EQUIPMENT ASEPTICALLY                      80.96   1.46   1.18  14.10
N    1 EXAMINE URINE SPECIMENS MACROSCOPICALLY                   87.82   1.32   1.16  15.26
J    6 SEPARATE SERUM FROM BLOOD                                 87.31   1.30   1.14  16.40
F   11 PREPARE REAGENTS                                          93.40   1.19   1.11  17.51
J    2 IDENTIFY MORPHOLOGICAL VARIATIONS OF BLOOD CELLS          80.07   1.21   1.06  18.57
M    4 OPERATE SPECTRO-PHOTOMETER                                77.66   1.34   1.04  19.62
J   21 PERFORM HEMATOLOGY PROCEDURES FOR ERYTHROCYTE             87.56   1.19   1.04  20.65
         SEDIMENTATION RATE
K    7 PERFORM SEROLOGICAL PROCEDURES FOR CARDIOLIPIN            78.93   1.30   1.03  21.60
         MICROFLOCCULATION
G    1 EXAMINE SPECIMENS MICROSCOPICALLY                         86.04   1.18   1.01  22.69
G    2 IDENTIFY AND CLASSIFY PATHOGENIC BACTERIA                 78.68   1.27   1.00  23.69
G   10 PREPARE CULTURE MEDIA                                     78.68   1.26   0.99  24.68
F   12 PREPARE SOLUTIONS AND STANDARDS                           86.55   1.09   0.94  25.62
M   25 PERFORM BIOCHEMICAL PROCEDURES FOR LIVER FUNCTION TESTS   78.93   1.18   0.93  26.55
M   27 PERFORM BIOCHEMICAL PROCEDURES FOR NPN AND BUN TESTS      79.95   1.16   0.93  27.48
G   11 STAIN BACTERIOLOGICAL SMEARS                              85.28   1.08   0.92  28.41
L    3 CROSSMATCH BLOOD                                          72.59   1.24   0.90  29.30
L   16 TEST BLOOD FOR ABO GROUPING AND ABO SUBGROUPING           80.20   1.12   0.90  30.20
J    1 IDENTIFY IMMATURE BLOOD CELLS                             86.29   1.04   0.89  31.09
I    2 EXAMINE SPECIMENS MICROSCOPICALLY                         81.47   1.08   0.88  31.97
G    6 PERFORM ANTIBIOTIC SENSITIVITY TEST                       75.38   1.17   0.88  32.85
F   14 PREPARE SPECIMENS FOR SHIPMENT                            84.26   1.03   0.87  33.72
E    3 LOG INCOMING OR OUTGOING SPECIMENS                        71.83   1.16   0.83  34.55
L   18 TYPE BLOOD OF DONORS AND RECIPIENTS                       74.87   1.10   0.83  35.38
L    2 CENTRIFUGE AND SEPARATE SERUM FROM CLOT                   73.10   1.11   0.81  36.19
M   33 PERFORM BIOCHEMICAL PROCEDURES FOR TOTAL PROTEIN AND      75.13   1.06   0.79  36.99
         A/G RATIO
L   17 TEST BLOOD FOR RHO OR DU FACTORS                          76.14   1.04   0.79  37.78
L    8 PERFORM DIRECT AND INDIRECT COOMBS TESTS                  75.38   1.04   0.78  38.56
M    5 PREPARE REAGENTS AND STANDARDS                            75.38   1.01   0.76  39.32
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J  27 PERFORM HEMATOLOGY PROCEDURES FOR PROTHROMBIN TIME               79.19   0.95   0.76  40.08
J   4 PERFORM SPINAL FLUID CELL COUNTS                                 84.52   0.88   0.74  40.82
I   1 EXAMINE SPECIMENS MACROSCOPICALLY                                79.95   0.92   0.73  41.55
I   6 IDENTIFY PROTOZOANS, CESTODES, NEMATODES, OR TREMATODES          74.62   0.95   0.71  42.26
F  19 COLLECT FECAL OR URINE SPECIMENS DIRECTLY FROM PATIENTS          52.79   1.33   0.70  42.96
J  28 PERFORM HEMATOLOGY PROCEDURES FOR RETICULOCYTE COUNT             84.26   0.82   0.69  43.65
N   8 PERFORM URINALYSES FOR BILE TESTS                                85.28   0.80   0.68  44.34
I   3 PERFORM CONCENTRATION AND FLOTATION TECHNIQUES                   72.84   0.93   0.68  45.02
J  13 PERFORM HEMATOLOGY PROCEDURES FOR COAGULATION TIMES BY           79.70   0.85   0.68  45.70
       CAPILLARY METHOD
M  34 PERFORM BIOCHEMICAL PROCEDURES FOR URIC ACID TESTS               70.81   0.96   0.68  46.37
N   3 PERFORM KIDNEY FUNCTION TESTS                                    76.14   0.89   0.68  47.05
J  30 PERFORM HEMATOLOGY PROCEDURES FOR THROMBOCYTE COUNT              80.46   0.83   0.67  47.72
J  14 PERFORM HEMATOLOGY PROCEDURES FOR COAGULATION TIMES BY           82.23   0.81   0.66  48.38
       LEE-WHITE METHOD
M  37 UTILIZE METHODS FOR COLORMETRIC PROCEDURE                        52.03   1.25   0.65  49.03
J  11 PERFORM HEMATOLOGY PROCEDURES FOR CEREBROSPINAL FLUID COUNT      80.96   0.80   0.65  49.68
M  32 PERFORM BIOCHEMICAL PROCEDURES FOR TOTAL CHOLESTEROL AND         68.27   0.93   0.63  50.32
       ESTERS TESTS
M  17 PERFORM BIOCHEMICAL PROCEDURES FOR CHLORIDES TESTS               71.07   0.89   0.63  50.95
N  12 PERFORM URINALYSES FOR OCCULT BLOOD TESTS                        82.49   0.76   0.63  51.58
E   5 MAINTAIN FILES OF CLINICAL LABORATORY REQUESTS                   54.82   1.14   0.63  52.20
J   8 PERFORM HEMATOLOGY PROCEDURES FOR BLEEDING TIME,                 71.83   0.86   0.62  52.82
       DUKE METHOD
M  38 UTILIZE METHODS FOR ELECTROLYTE DETERMINATIONS                   61.68   1.00   0.61  53.43
J  20 PERFORM HEMATOLOGY PROCEDURES FOR ERYTHROCYTE INDICES            79.44   0.75   0.59  54.03
M  11 PERFORM BIOCHEMICAL PROCEDURES FOR CALCIUM AND                   64.72   0.92   0.59  54.62
       PHOSPHORUS TESTS
E   7 MAINTAIN FILES OF LABORATORY RECORDS OR REPORTS                  51.27   1.14   0.59  55.20
J  25 PERFORM HEMATOLOGY PROCEDURES FOR L. E. TEST                     75.38   0.77   0.58  55.79
L   5 DRAW BLOOD FOR TRANSFUSIONS                                      64.47   0.90   0.58  56.36
K  13 PERFORM SEROLOGICAL PROCEDURES FOR HETEROPHILE PRESUMPTIVE        63.45   0.90   0.57  56.94
       AND DIFFERENTIAL ANTIBODY TEST
J  18 PERFORM HEMATOLOGY PROCEDURES FOR EOSINOPHILE COUNT              80.46   0.71   0.57  57.51
M   2 OPERATE FLAME PHOTOMETER                                         64.97   0.88   0.57  58.08
G   8 PERFORM SPERM COUNTS                                             79.44   0.71   0.57  58.65
J  29 PERFORM HEMATOLOGY PROCEDURES FOR SICKLE CELL PREPARATIONS       82.74   0.68   0.56  59.21
M  14 PERFORM BIOCHEMICAL PROCEDURES FOR CARBON DIOXIDE                67.26   0.83   0.56  59.77
       DETERMINATIONS
E  11 RECEIVE INCOMING SUPPLIES                                        55.58   0.96   0.53  60.31
L  15 STORE BLOOD ACCORDING TO GROUPING AND FACTOR                     59.90   0.89   0.53  60.84
F  20 COLLECT PUS SPECIMENS DIRECTLY FROM PATIENTS                     65.99   0.80   0.53  61.37
N  20 PERFORM URINALYSES FOR UROBILINOGIN TESTS                        75.89   0.66   0.50  61.87
K  14 PERFORM SEROLOGICAL PROCEDURES FOR LATEX FIXATION TEST           59.64   0.84   0.50  62.37
K   6 PERFORM SEROLOGICAL PROCEDURES FOR ''C'' REACTIVE                61.42   0.80   0.49  62.86
       PROTEIN TESTS
H   4 PERFORM KOH PREPARATION FOR DERMATOPHYTES                        68.02   0.72   0.49  63.35
A  10 DEVELOP AND IMPROVE WORK METHODS AND PROCEDURES                  53.55   0.91   0.49  63.84
L   4 DISPOSE OF BLOOD AFTER TIME LIMIT                                62.18   0.77   0.48  64.32
M   8 PERFORM BIOCHEMICAL PROCEDURES FOR BLOOD ALCOHOL TESTS           66.75   0.71   0.48  64.79
M  20 PERFORM BIOCHEMICAL PROCEDURES FOR CREATININE TESTS              61.42   0.76   0.47  65.26
L   6 MAINTAIN DONOR FILES                                             58.63   0.79   0.47  65.73
N  10 PERFORM URINALYSES FOR KETONE STUDIES                            55.33   0.84   0.46  66.19
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H   2 EXAMINE SPECIMENS MICROSCOPICALLY                          60.15   0.77   0.46  66.65
J  12 PERFORM HEMATOLOGY PROCEDURES FOR CLOT RETRACTION TEST     73.35   0.63   0.46  67.11
A   5 ASSURE THE AVAILABILITY OF EQUIPMENT AND SUPPLIES          42.64   1.06   0.45  67.57
A  26 REQUISITION SUPPLIES AND EQUIPMENT                         44.67   1.01   0.45  68.02
E  12 REQUISITION SUPPLIES                                       44.42   1.00   0.45  68.46
N  16 PERFORM URINALYSES FOR TOTAL PROTEIN                       63.45   0.70   0.44  68.90
M  21 PERFORM BIOCHEMICAL PROCEDURES FOR ENZYME ANALYSES         46.70   0.95   0.44  69.35
M  42 UTILIZE METHODS FOR TITRIMETRIC PROCEDURE                  55.33   0.80   0.44  69.79
M  13 PERFORM BIOCHEMICAL PROCEDURES FOR CARBOHYDRATES           44.67   0.98   0.44  70.23
        TOLERANCE TESTS
H   5 PREPARE CULTURE MEDIA                                      57.87   0.76   0.44  70.67
H   1 CULTIVATE MYCOLOGY SPECIMENS FOR PRIMARY ISOLATION         56.09   0.77   0.43  71.10
D   6 GIVE ON-THE-JOB INSTRUCTION IN MEDICAL                     40.10   1.04   0.42  71.51
        LABORATORY ACTIVITIES
N   7 PERFORM URINALYSES FOR BENCE-JONES PROTEIN TESTS           68.78   0.60   0.41  71.93
I   5 STAIN PARASITOLOGICAL SMEARS                               53.81   0.77   0.41  72.34
F  22 COLLECT SKIN SPECIMENS DIRECTLY FROM PATIENTS              58.12   0.71   0.41  72.75
K   8 PERFORM SEROLOGICAL PROCEDURES FOR COLD AGGLUTINATIONS     57.11   0.72   0.41  73.16
N   [illegible] PERFORM PREGNANCY TESTS                          48.48   0.84   0.41  73.57
C   [illegible] EVALUATE THE ACCURACY OF ROUTINE REPORTS         39.09   1.04   0.41  73.98
K   5 PERFORM SEROLOGICAL PROCEDURES FOR ANTISTREPTOLYSIN        48.48   0.82   0.40  74.37
        ''O'' TITERS
L  13 RECORD INFORMATION ON BLOOD RECORD CARD                    53.05   0.74   0.39  74.77
L   7 MAINTAIN FILES OF BLOOD BANKING FORMS                      53.30   0.74   0.39  75.16
F   9 PERFORM PREVENTIVE MAINTENANCE ON LABORATORY EQUIPMENT     47.72   0.82   0.39  75.55
F  24 COLLECT SPUTUM SPECIMENS DIRECTLY FROM PATIENTS            52.28   0.72   0.38  75.93
L   1 ATTACH SERIAL NUMBERS TO UNITS                             48.22   0.78   0.38  76.30
M   1 CALIBRATE INSTRUMENTS                                      52.03   0.72   0.37  76.68
L  14 SCREEN AND SCHEDULE DONORS                                 50.51   0.72   0.36  77.04
N   5 PERFORM URINALYSES FOR ADDIS COUNTS                        63.96   0.56   0.36  77.40
C   1 DETERMINE EQUIPMENT REPAIRS OR REPLACEMENTS NEEDED         47.21   0.76   0.36  77.76
O   9 PREPARE SPECIMENS FOR SHIPMENT                             39.85   0.89   0.36  78.12
L  11 PREPARE BLOOD FOR SHIPMENT                                 46.70   0.72   0.34  78.46
M  40 UTILIZE METHODS FOR GASOMETRIC PROCEDURE                   41.37   0.81   0.34  78.79
K  11 PERFORM SEROLOGICAL PROCEDURES FOR FEBRILE AGGLUTINATIONS  45.69   0.72   0.33  79.12
A  21 PLAN REPORTS FOR THE SECTION                               32.99   0.99   0.33  79.45
E   4 MAINTAIN AND REVISE STOCK LEVELS                           35.53   0.92   0.33  79.77
A  20 PLAN RECORD KEEPING FOR THE SECTION                        30.71   1.06   0.33  80.10
J  19 PERFORM HEMATOLOGY PROCEDURES FOR ERYTHROCYTE              59.14   0.55   0.32  80.42
        FRAGILITY TESTS
M  30 PERFORM BIOCHEMICAL PROCEDURES FOR SERUM FROG              40.61   0.78   0.32  80.74
        TEST FOR PREGNANCY
F   6 PERFORM BACTERIOLOGICAL OR CHEMICAL EXAMINATIONS OF WATER  41.37   0.74   0.31  81.05
H   6 STAIN MYCOLOGY SPECIMENS                                   48.22   0.62   0.30  81.34
N  17 PERFORM URINALYSES FOR URINARY CALCIUM                     54.57   0.54   0.30  81.64
N  14 PERFORM URINALYSES FOR PORPHYRINS TESTS                    54.57   0.54   0.30  81.94
G   3 MAINTAIN STOCK CULTURES                                    35.79   0.82   0.29  82.23
C   7 EVALUATE THE ADEQUACY OF ROUTINE REPORTS                   29.44   0.98   0.29  82.52
O  15 SUBMIT TISSUE SPECIMENS TO AFIP OR HISTOPATHOLOGY CENTERS  32.99   0.87   0.29  82.81
A   7 COORDINATE WORK ACTIVITIES WITH OTHER SECTIONS             36.55   0.77   0.28  83.09
A  14 ESTABLISH PROCEDURES FOR SPECIAL TESTS                     36.29   0.74   0.27  83.36
B   2 DIRECT SUBORDINATES IN MAINTAINING PERFORMANCE STANDARDS   30.96   0.87   0.27  83.63
E  10 PROCURE AND STORE BIOLOGICAL ITEMS                         35.53   0.75   0.27  83.89
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H   3 IDENTIFY AND CLASSIFY FUNGI                                 36.04   0.73   0.26  84.16
O   2 ASSIST WITH AUTOPSY                                         39.34   0.66   0.26  84.42
F   4 PERFORM BACTERIOLOGICAL OR CHEMICAL EXAMINATIONS OF         40.86   0.63   0.26  84.67
        FOOD PRODUCTS
L   9 PERFORM FIRST AID FOR SHOCK                                 51.02   0.49   0.25  84.92
K   2 PREPARE ANTIGENS                                            32.49   0.77   0.25  85.17
F  15 PREPARE SPECIMENS FOR TRAINING OR REFERENCE                 36.29   0.67   0.24  85.42
N  13 PERFORM URINALYSES FOR PHENYLPYRUVIC ACID TEST              46.95   0.52   0.24  85.66
E   1 SUPERVISE THE MAINTENANCE OF LABORATORY SUPPLIES            23.60   1.02   0.24  85.90
B   5 DIRECT THE MAINTENANCE AND UTILIZATION OF EQUIPMENT,        27.92   0.86   0.24  86.14
        SUPPLIES AND WORK SPACE
A   3 ASSIGN SPECIFIC WORK TO INDIVIDUALS                         30.96   0.78   0.24  86.38
C  10 RESOLVE TECHNICAL PROBLEMS OF SUBORDINATES                  28.43   0.83   0.24  86.62
M  19 PERFORM BIOCHEMICAL PROCEDURES FOR CREATININE               32.23   0.73   0.23  86.85
        CLEARANCE TESTS
D   8 INDOCTRINATE NEWLY ASSIGNED PERSONNEL                       35.28   0.67   0.23  87.09
C  14 INVESTIGATE POSSIBLE SOURCES OF STAPHYLOCOCCUS OUTBREAKS    28.43   0.82   0.23  87.32
A  25 PLAN WORK FLOW                                              25.13   0.92   0.23  87.56
C   9 EVALUATE WORK PERFORMANCE OF SUBORDINATES                   23.35   0.95   0.22  87.78
M  15 PERFORM BIOCHEMICAL PROCEDURES FOR CARBON MONOXIDE          39.09   0.57   0.22  88.00
        DETERMINATIONS
I   8 PREPARE CULTURE MEDIA                                       29.70   0.73   0.22  88.22
A  11 DEVELOP OR REVISE THE ORGANIZATION OF THE SECTION           26.40   0.81   0.21  88.43
B   4 DIRECT SUBORDINATES IN THE OBSERVANCE OF SAFETY PRACTICES   27.66   0.77   0.21  88.64
J   9 PERFORM HEMATOLOGY PROCEDURES FOR BLEEDING TIME, IVY METHOD 29.44   0.71   0.21  88.85
D  18 SHOW HOW TO LOCATE AND INTERPRET TECHNICAL INFORMATION      25.89   0.78   0.20  89.06
A  18 PLAN AND SCHEDULE WORK ASSIGNMENTS                          24.11   0.83   0.20  89.26
M  29 PERFORM BIOCHEMICAL PROCEDURES FOR SALICYLATE LEVEL         32.49   0.61   0.20  89.46
C  16 RECOMMEND SPECIAL CORRECTIVE ACTION FOR RECURRING PROBLEMS  26.65   0.72   0.19  89.65
C   8 EVALUATE THE MAINTENANCE AND USE OF EQUIPMENT,              23.86   0.80   0.19  89.84
        SUPPLIES AND WORK SPACE
N  18 PERFORM URINALYSES FOR URINARY CHLORIDES                    35.03   0.54   0.19  90.03
C  11 INSPECT AND EVALUATE ADHERENCE TO ESTABLISHED               18.78   0.99   0.19  90.21
        STANDARDS OF SANITATION, CLEANLINESS AND NEATNESS
L  12 PROCESS BLOOD FOR PACKED CELLS                              34.01   0.54   0.19  90.40
A  17 ESTABLISH WORK PRIORITIES                                   22.08   0.83   0.18  90.58
J  22 PERFORM HEMATOLOGY PROCEDURES FOR FIBRINOGEN ESTIMATIONS    35.28   0.49   0.17  90.76
E   6 MAINTAIN FILES OF LABORATORY CORRESPONDENCE                 22.59   0.76   0.17  90.93
C  10 INITIATE UNSATISFACTORY REPORTS ON EQUIPMENT                24.37   0.70   0.17  91.10
B  12 SUPERVISE THE PREPARATION AND MAINTENANCE OF                19.04   0.88   0.17  91.26
        RECORDS AND REPORTS
F   2 ASSIST OFFICERS OR SCIENTISTS IN RESEARCH ASSIGNMENTS       18.53   0.89   0.17  91.43
N  19 PERFORM URINALYSES FOR URINE ELECTROLYTES TESTS             28.43   0.58   0.16  91.59
A   2 ASSIGN SPACE FOR EQUIPMENT AND SUPPLIES                     26.40   0.61   0.16  91.75
D   9 INTERPRET POLICIES AND DIRECTIVES TO SUBORDINATES           23.60   0.68   0.16  91.92
J  26 PERFORM HEMATOLOGY PROCEDURES FOR PROTHROMBIN               26.40   0.60   0.16  92.07
        CONSUMPTION TEST
I   7 IDENTIFY PARASITIC AND DISEASE-CARRYING ARTHROPODS          25.89   0.60   0.15  92.23
M  41 UTILIZE METHODS FOR GRAVIMETRIC PROCEDURE                   18.27   0.84   0.15  92.38
C   3 EVALUATE COMPLIANCE WITH ESTABLISHED WORK STANDARDS         16.50   0.91   0.15  92.53
A  13 ESTABLISH PERFORMANCE STANDARDS                             15.99   0.87   0.14  92.67
E   8 MAKE LOCAL PURCHASE OF SUPPLIES                             17.51   0.79   0.14  92.81
D   1 ADMINISTER WRITTEN OR PERFORMANCE TESTS                     17.01   0.79   0.13  92.94
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K  10 PERFORM SEROLOGICAL PROCEDURES FOR COMPLEMENT                 19.04    0.70    0.13   93.08
      FIXATION TESTS
F  17 COLLECT BIOPSY OR AUTOPSY SPECIMENS DIRECTLY FROM PATIENTS    21.32    0.62    0.13   93.21
J  10 PERFORM HEMATOLOGY PROCEDURES FOR BONE MARROW EXAMINATIONS    22.08    0.59    0.13   93.34
B   7 MAINTAIN FILES OF PUBLICATIONS                                17.01    0.77    0.13   93.47
A   4 ASSIST OFFICER IN CHARGE IN ESTABLISHING                      20.56    0.63    0.13   93.60
      ORGANIZATIONAL POLICY
E   2 HANDLE PROPERTY TURN-IN                                       18.02    0.70    0.13   93.73
B   1 DIRECT SUBORDINATES IN MAINTAINING HIGH                       17.77    0.68    0.12   93.85
      STANDARDS OF PERSONAL HYGIENE
D   7 GIVE TRAINING OR LECTURES TO NON-MEDICAL                      18.27    0.66    0.12   93.97
      LABORATORY PERSONNEL
F   1 ASSIST IN EPIDEMIOLOGICAL INVESTIGATIONS                      20.30    0.59    0.12   94.09
F   8 PERFORM EKG TESTS                                             13.71    0.87    0.12   94.21
I   4 PERFORM MICROFILARIAL EXAMINATIONS                            23.60    0.49    0.11   94.32
E   9 PREPARE WORK ORDERS OR WORK REQUESTS                          18.27    0.62    0.11   94.44
A   6 COMPOSE LOCAL MEDICAL LABORATORY SOPS                         18.02    0.63    0.11   94.55
C   2 EVALUATE ADHERENCE TO WORK SCHEDULES                          14.21    0.78    0.11   94.66
D   4 DEVELOP ON-THE-JOB TRAINING MATERIALS                         15.99    0.69    0.11   94.77
A  16 ESTABLISH SANITATION STANDARDS                                13.45    0.80    0.11   94.88
M  39 UTILIZE METHODS FOR ELECTROPHORESIS                           10.15    1.05    0.11   94.99
A   1 ASSIGN PERSONNEL TO DUTY POSITIONS                            18.53    0.57    0.11   95.09
F   7 PERFORM BMR TESTS                                             16.75    0.62    0.10   95.20
A  19 PLAN MEDICAL LABORATORY ACTIVITIES                            15.23    0.67    0.10   95.30
M  23 PERFORM BIOCHEMICAL PROCEDURES FOR LACTIC                     13.45    0.75    0.10   95.40
      DEHYDROGENASE TESTS
M  22 PERFORM BIOCHEMICAL PROCEDURES FOR INSULIN TOLERANCE TESTS    16.24    0.61    0.10   95.50
K   3 PREPARE SPECIMENS FOR VIRUS ISOLATION                         17.26    0.56    0.10   95.59
C   5 EVALUATE PROCEDURES FOR STORAGE, INVENTORY AND                11.42    0.83    0.10   95.69
      INSPECTION OF PROPERTY ITEMS
A  23 PLAN THE PHYSICAL LAYOUT OF THE MEDICAL LABORATORY            14.21    0.67    0.10   95.78
      FACILITIES
J  23 PERFORM HEMATOLOGY PROCEDURES FOR GG TEST                     13.45    0.71    0.10   95.88
D  19 SUPERVISE ON-THE-JOB TRAINING PROGRAMS                        12.44    0.75    0.09   95.97
D  12 REVIEW TRAINING PROGRESS OF INDIVIDUALS                       12.69    0.73    0.09   96.07
C  17 RESOLVE PERSONAL PROBLEMS OF SUBORDINATES                     15.48    0.60    0.09   96.16
K   9 PERFORM SEROLOGICAL PROCEDURES FOR COLLOIDAL GOLD TEST        14.97    0.59    0.09   96.25
B   3 DIRECT SUBORDINATES IN MAINTAINING SECURITY STANDARDS         13.45    0.63    0.09   96.33
O  14 STAIN SPECIMENS FOR MICROSCOPIC STUDY                          7.11    1.19    0.08   96.42
D  14 ROTATE DUTY ASSIGNMENTS OF PERSONNEL                          12.69    0.66    0.08   96.50
F   5 PERFORM BACTERIOLOGICAL OR CHEMICAL EXAMINATIONS OF SEWAGE    14.97    0.52    0.08   96.58
D   5 EVALUATE TRAINING EFFECTIVENESS                               10.15    0.75    0.08   96.65
D   3 CONDUCT CONFERENCES AND CLASSES                               12.18    0.63    0.08   96.73
M   7 PERFORM BIOCHEMICAL PROCEDURES FOR BARBITURATE LEVEL          14.21    0.54    0.08   96.81
M  10 PERFORM BIOCHEMICAL PROCEDURES FOR BLOOD PH TESTS             17.26    0.44    0.08   96.88
M  12 PERFORM BIOCHEMICAL PROCEDURES FOR CALCULUS ANALYSES           9.39    0.80    0.08   96.96
O   7 PREPARE ROUTINE STAINS                                         8.38    0.90    0.08   97.03
J   7 PERFORM HEMATOLOGY PROCEDURES FOR ACID HEMOLYCINS TESTS        8.88    0.82    0.07   97.11
O  12 SECTION TISSUE IN MICROSCOPIC BLOCKS                           4.82    1.51    0.07   97.18
I  10 PERFORM SEROLOGICAL TESTS FOR PARASITES                       12.18    0.59    0.07   97.25
O  17 USE MICROTOME                                                  5.84    1.24    0.07   97.32
J  16 PERFORM HEMATOLOGY PROCEDURES FOR CRYOGLOBULIN TESTS          14.21    0.51    0.07   97.40
D  10 MAINTAIN TRAINING RECORDS                                     11.17    0.65    0.07   97.47
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M  20 PERFORM BIOCHEMICAL PROCEDURES FOR PBI TESTS                     6.60      1.08      0.07     97.54
I   9 MAINTAIN PARASITE CULTURES                                      11.42      0.62      0.07     97.61
J  15 PERFORM HEMATOLOGY PROCEDURES FOR COAGULATION TIMES BY         10.91      0.63      0.07     97.68
        MODIFIED HOWELL METHOD
H   9 PERFORM BIOCHEMICAL PROCEDURES FOR BLOOD OXYGEN TESTS          12.69      0.54      0.07     97.75
O  11 PREPARE TISSUE FOR FIXATION, DEHYDRATION, AND                   6.35      1.04      0.07     97.81
        INFILTRATION OF PARAFFIN
D   2 ARRANGE FOR TRAINING AIDS, SPACE AND EQUIPMENT                  9.64      0.64      0.06     97.88
O  16 USE AUTOTECHNICON                                               6.85      0.90      0.06     97.94
C  13 INSPECT THE PHYSICAL LAYOUT OF THE                              9.39      0.66      0.06     98.00
        MEDICAL LABORATORY FACILITIES
O   5 MOUNT TISSUE SECTION IN PREPARATION FOR MICROSCOPIC STUDY       5.08      1.20      0.06     98.06
F  21 COLLECT SEROUS CAVITY SPECIMENS DIRECTLY FROM PATIENTS         10.15      0.57      0.06     98.12
M   6 PERFORM BIOCHEMICAL PROCEDURES FOR ALKALOIDS                    7.87      0.73      0.06     98.18
A   8 DESIGN ORGANIZATIONAL OR FUNCTIONAL CHARTS                     12.44      0.45      0.06     98.23
O   4 EMBED TISSUE IN PARAFFIN                                        6.09      0.92      0.06     98.29
A  24 PLAN THE SECTION SAFETY PROGRAM                                 8.63      0.65      0.06     98.34
M  36 UTILIZE METHODS FOR CHROMATOGRAPHY                              5.84      0.96      0.06     98.40
F  16 COLLECT BILE SPECIMENS DIRECTLY FROM PATIENTS                   7.87      0.71      0.06     98.46
D  13 REVIEW TRAINING STATUS OF THE SECTION                           7.87      0.70      0.06     98.51
K  15 PERFORM SEROLOGICAL PROCEDURES FOR STREP MG TEST               10.66      0.52      0.06     98.57
D  15 SCHEDULE ON-THE-JOB TRAINING                                    8.12      0.64      0.05     98.62
G   4 PERFORM ANIMAL INOCULATIONS                                     8.38      0.61      [illegible] [illegible].67
O  13 STAIN PAP SMEARS                                                7.11      0.70      0.05     98.72
A   9 DETERMINE PERSONNEL REQUIREMENTS                                9.39      0.51      0.05     98.77
O  18 USE MICROTOME KNIFE SHARPENER                                   4.82      0.99      0.05     98.82
B   9 SUPERVISE SUBORDINATE SUPERVISORS                               5.58      0.85      0.05     98.86
D  11 RECOMMEND INDIVIDUALS FOR TRAINING                              7.87      0.56      0.04     98.91
M  24 PERFORM BIOCHEMICAL PROCEDURES FOR LIPIDS PRO[illegible]E              8.12      0.54      0.04     98.95
O   8 PREPARE SPECIAL STAINS                                          5.08      0.82      0.04     98.99
A  15 ESTABLISH RESEARCH PROCEDURES                                   6.35      0.63      0.04     99.03
F  23 COLLECT SPINAL FLUID SPECIMENS DIRECTLY FROM PATIENTS           5.84      0.68      0.04     99.07
B   8 MAINTAIN STATUS BOARDS OR CHARTS                                6.35      0.62      0.04     99.11
K   1 IDENTIFY VIRUSES AND RICKETTSIA                                 6.60      0.59      0.04     99.15
M  16 PERFORM BIOCHEMICAL PROCEDURES FOR CATECHOLAMINE TESTS          5.33      0.69      0.04     99.19
A  27 SCHEDULE LEAVES OR PASSES                                       7.36      0.49      0.04     99.22
K   4 PERFORM SEROLOGICAL PROCEDURES FOR ANTICOMPLEMENTARY            6.60      0.55      0.04     99.26
        RETESTS
J  31 PERFORM HEMATOLOGY PROCEDURES FOR THROMBOPLASTIN                7.61      0.48      0.04     99.30
        GENERATION TESTS
M  18 PERFORM BIOCHEMICAL PROCEDURES FOR CORTISONE AND                3.55      0.99      0.04     99.33
        STEROID STUDIES
C   4 EVALUATE INDIVIDUALS FOR PROMOTION AND UPGRADING                6.60      0.52      0.03     99.37
C  15 RECOMMEND CHANGES IN PUBLICATIONS                               6.85      0.50      0.03     99.40
O   1 ASSIST IN PREPARATION OF GROSS SPECIMENS FOR                    7.87      0.43      0.03     99.44
        MEDICAL PHOTOGRAPHY
P   5 MAINTAIN REFERENCE FILE OF ILLUSTRATIONS                        4.57      0.72      0.03     99.47
O   3 DECALCIFY SPECIMENS OF TEETH AND BONE                           5.08      0.63      0.03     99.50
L  10 PERFORM GENOTYPE OF ANIMAL BLOOD                                4.57      0.63      0.03     99.53
O   6 PREPARE FROZEN SECTION OF TISSUE                                3.81      0.75      0.03     99.56
P   1 COLLECT AND ASSEMBLE MEDICAL ILLUSTRATION MATERIAL              5.33      0.52      0.03     99.59
K  12 PERFORM SEROLOGICAL PROCEDURES FOR HEMAGGLUTINATION             4.57      0.57      0.03     99.61
        INHIBITION TEST
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B  6 DRAFT AND SUBMIT JOB DESCRIPTIONS                                  5.33   0.48   0.03   99.64
N 11 PERFORM URINALYSES FOR LEAD TESTS                                  5.84   0.43   0.02   99.66
G  5 PERFORM ANIMAL VIRULENCE TESTS                                     2.28   1.06   0.02   99.69
B 10 SUPERVISE THE DISASTER CONTROL PROGRAM                             3.55   0.64   0.02   99.71
C 12 INSPECT AND EVALUATE THE MAINTENANCE OF                            3.55   0.61   0.02   99.73
       STATUS BOARDS OR CHARTS
A 22 PLAN STATUS BOARDS OR CHARTS                                       3.81   0.52   0.02   99.75
O 10 PREPARE TISSUE FOR CELLODIAN EMBEDDING AND SECTIONING              1.78   0.95   0.02   99.77
G  7 PERFORM FLUORESCENT ANTIBODY TECHNIQUE                             3.30   0.51   0.02   99.78
G  9 PREPARE AUTOGENOUS VACCINES                                        3.05   0.47   0.01   99.80
F 13 PREPARE SPECIMENS FOR ELECTRON MICROSCOPY                          1.52   0.86   0.01   99.81
P  2 DISTRIBUTE MEDICAL ILLUSTRATION MATERIAL                           2.79   0.45   0.01   99.82
D 16 SELECT AND ASSIGN INSTRUCTORS                                      2.28   0.49   0.01   99.84
C 19 WRITE TECHNICAL PAPERS FOR PUBLICATION                             2.03   0.50   0.01   99.85
M  3 OPERATE SPECTRO-FLUOROMETER                                        1.52   0.65   0.01   99.86
Q  1 ASSIST MEDICAL RADIOLOGICAL LABORATORY OFFICER IN                  1.27   0.75   0.01   99.86
       PREPARING AND COUNTING SAMPLES
A 12 DRAFT BUDGET ESTIMATES                                             2.28   0.39   0.01   99.87
P  3 DRAFT AND PREPARE ILLUSTRATIONS                                    1.27   0.69   0.01   99.88
P  4 DUPLICATE ILLUSTRATED MATERIALS                                    2.28   0.38   0.01   99.89
D 17 SELECT INDIVIDUALS FOR SPECIALIZED TRAINING COURSES                2.28   0.37   0.01   99.90
Q  3 CONDUCT TESTS FOR PRESENCE AND MEASUREMENT OF RADIOACTIVITY        1.27   0.55   0.01   99.91
M 35 PERFORM BIOCHEMICAL PROCEDURES FOR VITAMIN ASSAYS                  1.27   0.47   0.01   99.91
M 31 PERFORM BIOCHEMICAL PROCEDURES FOR SERUM MAGNESIUM TESTS           1.52   0.35   0.01   99.92
Q  8 RECORD AND SUMMARIZE DATA                                          0.76   0.64   0.00   99.92
B 11 SUPERVISE THE HEALTH PHYSICS PROGRAM                               1.02   0.46   0.00   99.92
M 26 PERFORM BIOCHEMICAL PROCEDURES FOR NORADRENALINE STUDIES           0.76   0.61   0.00   99.93
Q  4 COUNT FLUID SPECIMENS                                              0.76   0.56   0.00   99.94
Q 12 USE SCALING DEVICES                                                0.51   0.69   0.00   99.94
Q  2 CALIBRATE INSTRUMENTS                                              0.51   0.68   0.00   99.94
Q 10 USE CRYSTAL AND LIQUID SCINTILLATION DETECTORS                     0.25   0.63   0.00   99.94
Q  9 SEGREGATE AND PREPARE RADIOACTIVE SPECIMENS FOR                    0.51   0.31   0.00   99.95
       MEASUREMENT OF RADIOACTIVITY
Q 11 USE GEIGER-MUELLER EQUIPMENT                                       0.25   0.58   0.00   99.95
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What Can Happen When There Are Enough Counselors; One Approach At A Two-Year Technical Institute

By Francis D. Harding

The previous speakers have discussed applications of very interesting research techniques to important aspects of vocational education and guidance. I am somewhat embarrassed because I do not have a package of research data to distribute among you. This is especially painful because much of my professional life was spent as a research psychologist and it has been only fairly recently that I became a productive member of society--as an administrator at a two-year technical institute. As many of you know, in the real world of institutionalized learning, it is an accomplishment to be able to identify the problems, let alone to carry out sophisticated research on them. However, ever so often, there comes along the opportunity to start from scratch and to design the kind of learning environment which will reflect the way things should be. Washington Technical Institute presents an opportunity to structure a two-year technical education program which will effectively serve the needs of an urban population. The plan of this report is to describe some of the situational variables which exist at the school; to outline the plan of action as it relates to counseling activities; and to discuss some specific problem areas.

Let me begin by saying that Washington Technical Institute was established by Congress to provide vocational and technical education to the residents of the District of Columbia so as to prepare them for entry into meaningful occupations.

A pragmatic occupational orientation was evidenced from the start. The selection of curricula to be offered was based upon occupational and manpower surveys of the D.C. metropolitan area. As a result of these surveys, curricula leading to the Associate degree were developed in the areas of Health Science; Business; Engineering Technology; Computer Science; Public Administration; Science Technology; and Criminal Justice. The guiding philosophy of the school is to be student-centered with learning objectives stated in measurable behavioral terms. In an effort to overcome some of the lock step features which so often characterize educational practices, planning and staffing were geared to an individualized learning approach. The school is staffed with one instructor to every 16 students and one counselor to every 40 students. (It is this last ratio of one to 40 that makes W.T.I. unique and, I hope, interesting to this audience.) We opened this past September with approximately 1300 students; now, at the end of the second quarter, we have about 1900 students.

W.T.I. is an open-door, community college, accepting as many applicants as facilities and resources will permit. Because demand far exceeds capacity, admission is on a first come, first serve basis. Applicants are notified of acceptance and asked to report for pre-enrollment testing and interviews. You will note that the tests/interviews are given after notification of acceptance. This was done on purpose to assure the applicant that the interviews and the tests which he is being asked to take are for the purpose of guidance and placement and not as screening devices. The applicant is first given a battery of tests. This year the tests will include the College Qualification Test battery and the Kuder DD.

Included in the CQT battery are Verbal, Numerical, and General Information subtests, as well as the Davis Reading Test. For students who are applying for a particular curriculum such as Computer Science, appropriate specialized aptitude tests will be administered. As is usually the case when population is drawn from the so called inner city, one has to be extremely careful in drawing conclusions until local norms and validity studies are accomplished. We are in the process of doing this, but, as I will indicate later, I feel that certain non-cognitive motivational factors are of much greater importance than those factors measured by the above instruments.

After the tests have been scored, the individual returns for an interview. A feature of this interview is the retracing of the decision-making process that was used to decide which curriculum area the applicant was interested in pursuing.

Although the applicant indicated a curriculum choice at the time he applied, we have learned to be somewhat suspicious of such declarations. Among our first class, we found that about half changed their curriculum area as a result of the interview. We feel that this was because of lack of sufficient information available to make realistic decisions. For students from the inner city this is especially true: the conditions of higher education or the nature of technical-professional occupations are not too well understood. Thus, the information-giving function of the interview is very important. Also important, is the exploration of the aspirational and motivational aspects of the choice of curriculum Consideration of the reasons for attending college or for desiring a particular kind of a career can provide a firmer basis for decision making. It is important that the student make as good an initial decision as possible because students in a two-year institute are forced to specialize from the outset. They are not afforded the luxury of shopping around for a semester or two before settling in a major field.

The integrating of test data into the individual's choice of curriculum area and expected level of attainment is also very critical. Many inner city students have not been exposed to educational guidance given under favorable conditions. This tends to lessen the predictive value of previous academic performance and group test data that may be recorded on high school transcripts.

During the interview we do not attempt to force an individual to undertake a particular curriculum, no matter how suitable it may be for him. The counselor apprises him of all the facts - his possible options; his probability of success.

The decision is the applicant's. The counselor has a rather delicate role to play: he must insure that the applicant has as much information as possible, and he must guide the decision-making process while letting the choice be the applicant's

Our use of such a large number of counselors is based upon this premise: during their stay at W.T.I. our students are developing socially, culturally, and vocationally, as well as educationally. To assist them adequately along all these dimensions, a large commitment in professional personnel is required. To emphasize the developmental aspects of our efforts, we have called our counselors "Development Advisors". Hopefully, this will aid in the establishment of the proper image. The Development Advisors have three facets to their job. The first is to concentrate on the vocational or career development of their Advisees. The second function is to act as a Learning Specialist so that they may understand and facilitate the learning activities that their Advisees are undergoing.

The third facet to the job is to provide the necessary supportive counseling in the emotional and psychological areas.

Let us first consider the Development Advisors' activities in the area of vocational development. An important activity is the encouraging of a mature attitude toward one's potential career.

An individual's preparation for a career includes not only the acquisition of required skills and knowledge but also the development of a vocational readiness or maturity. The latter may be described as the kind of behavior which permits an individual to be accepted on a job and to advance at a normal rate. The attainment of such maturity can be a complex process. For students in a two-year technical institute, this development must be compressed into half the time allowed to graduates of a four-year school. We therefore attempt to "force-feed" vocational maturity by encouraging students to work part-time in jobs which are related to their curriculum areas. Most of our students have jobs, but some are far afield from their educational efforts and thus do not contribute much to their preparation for the careers they will enter upon graduation. One task of the Development Advisor is to seek out suitable part-time employment and "feed" his Advisees into appropriate positions. We have endeavored to develop a system which will coordinate our efforts in this area so that the leads one Development Advisor uncovers will be available to the whole group. We try also to stress the close relationship of our educational efforts and vocational pursuits by proclaiming that "the name of the game is jobs". We hope that this emphasis will enable the student to see the relevance of his studies and work experiences to his future career.

How successfully this interpretation is accomplished has much to do with the motivational level of our students. Students want to see real prospects for getting good jobs upon completion of their training. At a new school which was established to provide a supply of skilled manpower where none existed before, a certain amount of strain is placed upon the credulity of the students who are asked to accept a good deal on faith alone. For inner city youths, this is all the more difficult because of the scarcity of successful technicians. Thus, the student sees little evidence of the pot of gold at the end of his individual rainbow. Our Development Advisors must be constantly cognizant of this problem and do everything possible to make job prospects more real for their Advisees. One way to do this is to interpret manpower surveys in a personally meaningful way which will indicate the potential need for the kind of skills our students are acquiring.

Another way in which we are attempting to facilitate our students' vocational readiness is by the preparation of Job Fact Brochures. This is an attempt to package together all kinds of information about a particular career field. The types of information contained here include: 1) fairly detailed descriptions of entry-level positions and more general descriptions of positions which come later as the individual progresses within the career field; 2) job requirements; 3) rates of pay; 4) descriptions of working conditions; 5) availability and location of possible employment. Because of our location in Washington, D.C., definite attention will be given to the problems of entering and progressing within the Civil Service system.

Let us turn to the second facet of the Development Advisor's role - that of being a specialist in learning. The major question in this regard is how does the Development Advisor help the student learn? As he is not a subject matter specialist and may not be qualified to serve as a resource person in substantive or technical matters, his influence must be more in the area of facilitating the individual learner's efforts. He should be aware of what behavioral modifications are being sought in a particular learning situation and be ready to assist the learner in acquiring the modifications. A Development Advisor's contribution is greatest in the context of an individualized learning environment where he can concentrate on one or a few individuals in a particular learning situation. To be effective, he should be perceptive of the skills, knowledge, habits, learning style, etc. that the student brings to the situation. Based upon earlier discussions with the subject-matter expert, the Development Advisor should understand the objectives of the learning exercise and optimally have discussed with the instructor various teaching strategies. His role should complement the instructor's efforts in the formal teaching process. This is the essence of the team approach mentioned earlier.

To accomplish this rather sanguine concept of a team in which teachers, development advisors, and learners work together is a major undertaking not devoid of pit falls (as I am finding out). It requires on the part of all concerned a level of competence and maturity which must be carefully nurtured. Old roles and relationships must be cast off and anxieties about status repressed for the common good. Let me mention some attributes that I think a Development

Advisor should possess to operate effectively. He should have an understanding of those facets of educational psychology which can be manipulated in the practical learning situation. By this I do not mean that he has to be cognizant of all the nuances of learning theory, but he must have more than the nodding acquaintance of learning theory usually gained from a survey course in educational psychology. He should be familiar with and competent in the use of the various media that has resulted from the educational technology explosion.

At this juncture I would like to stress as clearly as I can, a conviction that I have that the counselor - student relationship that the Development Advisor has with his Advisee is that added ingredient which makes him more effective than the educational technologist. The Development Advisor has a deeper understanding of the student as a person than the educational specialist can be expected to have. I realize that it is gratuitous of me to mention the importance of the social and psychological factors that affect an individual's learning performance. However, to foster efficient learning, such influences must be considered and managed. I think the counselor relationship which our Development Advisors achieve helps us to do this. As one of my D.A.'s has said "If you really care about a person, you will take the trouble to understand him". This is very important in this age of racial tensions and generation gaps.

This role of the Development Advisor takes him out of his office and puts him where the action is - and in an educational institution, the action is learning. I would be less than honest if I were to say that all my Development Advisors or all the instructional staff fully subscribe to such active participation by D.A.'s. However, I think they are learning the desirability and necessity of such an approach. One reason for such involvement is the matter of the students' readiness to benefit from an educational experience built around a multi-media, individualized approach. Many students have been victimized by poor educational practices and I am not speaking just of our particular group of students but of students graduating from many of our secondary systems throughout the country. They have not been challenged or motivated enough to achieve up to their potential. In fact, it has only been very recently that there was any reason for many of them to participate actively in learning. Now, with many of our institutions of higher learning actively recruiting students from the inner city and poorer rural sections, we are confronted with a situation in which we are reaping the results of our earlier failures. The resulting frustrations have been a major contribution to student unrest. It is my contention that a more responsive counseling effort would do much to alleviate some of these conditions.

Let me speak specifically to what all this means to our Development Advisors as they endeavor to facilitate their Advisee's learning. We find that some of our students bring with them educational deficiencies in arithmetical computations. This inhibits the full utilization of the opportunities available to them. I have come to realize that it is naive to think that because students have access to advanced educational media and technology they will attack learning voraciously and not only overcome their short-comings, but will spurt ahead to new levels of achievement. The sad truth is that they are unable to do so because of previously developed ineffective study habits and unfavorable attitudes toward educational activities. In such situations, directors of learning should realize that their efforts must extend beyond the mere providing of the opportunity to learn.

Each individual learner must be convinced that he can learn, and that the benefits to be gained are worth the efforts required. Accordingly, Development Advisors should be involved with the student's efforts to evolve a new self-image. In addition, students need frequent recharging of their motivational batteries. Two years is a long time and many difficulties must be overcome before the student graduates. The D.A.'s must be prepared to provide support to their Advisees so that their enthusiasm remains high. To accomplish the kind of learning we have been describing, it is necessary that continual assessment and feed-back take place. Not only does the student need frequent reinforcement; academic instructors must have information on which to base their teaching strategies. The Development Advisor plays a key role in the feed-back function of assessment. His close relationship to the student makes him a natural channel of assessment information. His demonstrated interest in the student's development enables him to present the feed-back in a supportive rather than in an evaluative fashion. An important aspect of his efforts should be explaining to the student the implications of the assessment. In some cases he may find himself having to explain the teacher and student to each other. The Development Advisor can add an overall viewpoint to the assessment process. He should collect and synthesize evaluations from the student's various courses and be able to add his own evaluations of the student based upon his many contacts with the student. His inputs might well provide insight into the student's performance which would go unnoticed if classroom behavior were the sole source of observations. The Development Advisor can relate his assessments to the aptitudinal and aspirational data collected from early contacts with the student.

It is essential that the student's long range objectives be kept in mind. Continuity is something that often is lacking in the counseling a student receives. The Advisor should endeavor to provide this needed stability.

Assessments can only be effective when there is a free exchange of information. Lack of understanding or mutual trust can defeat the purpose of assessment. Instructors and students must view the information as helpful in attaining their objectives. This is sometimes difficult to do because the evaluative process can be quite anxiety-producing. Such difficulties can be minimized by a careful spelling out of objectives and behavioral criterion. The less ambiguity in the desired terminal behavior, the easier it is to do a proper assessment of the learning process.

Some of the outcomes of assessment have impact beyond the revising of teaching strategies and course assignments; they will have long range effect on the lives of the students. As a result of assessments, some students will need to be redirected toward alternative educational or vocational objectives, rather than be allowed to pursue their original choices. It is a fact, that at some point, the Open Door policy of a school must become somewhat selective. At W.T.I. we try to give the individual every possible chance to demonstrate his capabilities, rather than to pre-judge and to assign him to a particular niche on the basis of data of doubtful validity. While I subscribe to the precept "that the best predictor of future performance is past performance" this is only as true as the conditions remain similar. I would hope that W.T.I. presents a learning situation which is an entirely new deal for many of our students, and that past performance may not be such a good predictor. Therefore, we try to keep several options open for our students. Some may be able to raise their objectives higher than they had supposed possible while others may have to lower their levels of aspiration and accept the fact that they can not reasonably expect to obtain associate degrees. The Development Advisors work just as hard with the student who can't profit by continuing his efforts toward a degree as they do with their more successful Advisees. They attempt to obtain suitable employment and to maintain contact so that the drop-out will obtain maximum benefit from his connection with W.T.I. This may well be one of our most important contributions.

One final comment on our efforts to launch this massive guidance and counseling effort. I would like to discuss for a moment how we intend to evaluate the effectiveness of our program. This is a vital question, not only for us but for those responsible for any counseling program. Subjectively, I am sure that we have had a beneficial effect on the school and on the students but I sometimes wonder just how much we really are adding to the overall good and welfare. If we didn't exist, students would perhaps, still achieve their learning objectives, be graduated, and enter technical careers. I must say that I share some of the skepticism with which our efforts are viewed by others. Because of this, I have stressed the need for extensive documentation and program review. While wewon't be able to compare ourselves to any control group, we can at least develop objective records and carry out longitudinal studies. What are some of the criteria which we should use to measure our effectiveness? An obvious set of criterion data should be concerned with attrition figures. What is the drop out rate? What are the reasons for attrition? What is the course failure rate? - by Development Advisor? Conversely, does amount or kind of advising have any effect on excellence of performance? Is there any difference in the rates of pay for those who obtained employment as a result of a counselor's efforts as compared to those students who didn't use the help of a counselor in obtaining a job? In the area of learning, how do you measure the effect of counselors on learning progress?

We haven't had time to obtain answers to such questions yet. However, I am sure that such an objective evaluation is as important as anything we can do. I hope that we are up to the task of such a program evaluation because it is only on the basis of such facts that counseling will become less of an art and more of a science.

COMMENT

W. Wesley Tennyson

Drawing upon the disciplined research tradition of the military and the emerging commitment of vocational education to guidance, the symposium presenters through these several papers have described technological and curricular developments which have significant implications for school counselors. Rather than looking with too critical an eye at these developments and the manifold problems of introducing them into public education, this commentary will focus instead upon explicating some of the meanings they may have for the functional role of the counselor in education.

Counselors who conceive the task of vocational guidance to be primarily that of predicting occupational choice and performance will be impressed, but not entirely comforted, by Valentine's critical analysis of research on vocational assessment; they may be encouraged by the potential of Christal's efforts to inventory and process worker attitude and job function data. In one of the clearest statments available, Valentine has explained the limitations for counseling of regression data designed to predict normative behavior for personnel selection; he appropriately recognizes the advantage of discriminant function techniques which enable one to estimate the similarity of a person's characteristics to a given occupationa group. Christal stretches our imagination by showing the range of information that is retrievable through organized data banks and the use of the computer.

A relationship between several of the developments reported in these papers can be noted when consideration is given to Valentine's provocative suggestion that classical prediction strategies be modified to include performance measures and assessments based upon work samples. The behavioral assessment material

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needed to verify his hypothesis that future performance in an occupation is predicted best by past performance could conceivably come through Morrison's efforts to translate curriculum goals into explicit statments of performance. Developments of the kind recommended by Christal provide a type of information which if fed back into curriculum construction would result in closer congruence between vocational training objectives and occupational requirements. Thus, these several thrusts, taken together, should permit occupational researchers to probe further the limits and efficiencies of the classical (or behavioral) prediction model. This is as it should be, but is it enough?

An interesting philosophical question is raised when the combined work of Valentine and Christal is thought about in relation to the program at Washington Technical Institute, a program which emphasizes developmental counseling. Does a vocational guidance strategy based essentially on the Parsonian concept of matching (irrespective of the assessment methods employed) provide an adequate framework for the school counselor? The question has been asked before, but its implications have not been brought home to counselors or to those who have a hand in the preparation of counselors.

The preoccupation of counselors and counselor educators with the problem of immediate vocational choice has imposed functional constraints which have limited the potential influence counselors might have upon students' vocational development. These constraining effects are of several kinds. First, indoctrinated as they have been with a single strategy, school counselors have forced decisions of choice upon students who were not developmentally ready for them. In some instances this has had the effect of arresting development at early vocational stages. One may speculate that a recognition of the inappropriateness of the model to much of their work is a principal reason why many counselors have come to reject vocational guidance. Second, by concentrating upon assessment of abilities presumed to be related to choice outcomes, counselors have neglected to concern themselves with the development of abilities and aptitudes. While it is generally recognized that what a person is able to do depends to a considerable extent upon what he has learned or practiced, guidance personnel have been inclined to capitalize upon aptitudes already developed rather than cultivating new talents. Third, an ingrained devotion to the part that cognitive information and factual data play in choice-making has made it difficult for many practitioners to recognize that occupational motives and behaviors are the result of a complex process of development and experience, involving dynamic needs, values and personal striving. This development can be systematically influenced through directed occupational experiences and appropriate classroom learnings. Fourth, the focus upon choice has perpetuated the disjuncture between guidance and the curriculum by confining the counselor to an office. The guidance specialist has thereby been distracted from the larger task of mobilizing forces for change in the school, helping to build a program which takes into account student needs.

Prediction models which relate test scores or behavioral attribute data to entry level occupations offer something of value to the school counselor, but their value is limited. As we move into the 1970's, it is important that the conception of vocational guidance held by theorists, researchers, and practicing counselors be broadened to give attention to the process by which vocationally relevant behavior is developed and expressed. Much of the current theory construction and empirical research in vocational psychology shows a fundamental shift in emphasis away from specific decision-making to preparation for decision-making. The direction is right, but it does not go far enough.

Schools are organized along lines very similar to the organization of business and industrial enterprise. Important components of the adult work personality find their first points of development during the school years: the ability to become involved in a work task and see it to completion, the ability to relate to supervisory authority, the ability to work cooperatively with peers in a group effort, the development of meanings and values associated with work, and the development of effective work habits. It is a task of vocational guidance to help shape these behaviors.

Beyond this, the school counselor functioning within a broadened concept of vocational guidance will make organizational interventions which have a positive effect not only on the process of learning, but on the content of that learning as well. Harding's program bears watching, for it tests the assumption that counselors can capitalize upon the natural relatedness of career and self-development through a more direct involvement with learners, teachers and curriculum.